

Fishery Management Report for Sport Fisheries in the Lower Tanana River Management Area for 1998

by

Mike Doxey

November 2000

Alaska Department of Fish and Game

Division of Sport Fish



Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used in Division of Sport Fish Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications without definition. All others must be defined in the text at first mention, as well as in the titles or footnotes of tables and in figures or figure captions.

Weights and measures (metric)		General		Mathematics, statistics, fisheries	
centimeter	cm	All commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.	alternate hypothesis	H _A
deciliter	dL	All commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	e
gram	g	and	&	catch per unit effort	CPUE
hectare	ha	at	@	coefficient of variation	CV
kilogram	kg	Compass directions:		common test statistics	F, t, χ^2 , etc.
kilometer	km	east	E	confidence interval	C.I.
liter	L	north	N	correlation coefficient	R (multiple)
meter	m	south	S	correlation coefficient	r (simple)
metric ton	mt	west	W	covariance	cov
milliliter	ml	Copyright	©	degree (angular or temperature)	°
millimeter	mm	Corporate suffixes:		degrees of freedom	df
Weights and measures (English)		Company	Co.	divided by	÷ or / (in equations)
cubic feet per second	ft ³ /s	Corporation	Corp.	equals	=
foot	ft	Incorporated	Inc.	expected value	E
gallon	gal	Limited	Ltd.	fork length	FL
inch	in	et alii (and other people)	et al.	greater than	>
mile	mi	et cetera (and so forth)	etc.	greater than or equal to	≥
ounce	oz	exempli gratia (for example)	e.g.,	harvest per unit effort	HPUE
pound	lb	id est (that is)	i.e.,	less than	<
quart	qt	latitude or longitude	lat. or long.	less than or equal to	≤
yard	yd	monetary symbols (U.S.)	\$, ¢	logarithm (natural)	ln
Spell out acre and ton.		months (tables and figures): first three letters	Jan,...,Dec	logarithm (base 10)	log
Time and temperature		number (before a number)	# (e.g., #10)	logarithm (specify base)	log ₂ , etc.
day	d	pounds (after a number)	# (e.g., 10#)	mideye-to-fork	MEF
degrees Celsius	°C	registered trademark	®	minute (angular)	'
degrees Fahrenheit	°F	trademark	™	multiplied by	x
hour (spell out for 24-hour clock)	h	United States (adjective)	U.S.	not significant	NS
minute	min	United States of America (noun)	USA	null hypothesis	H ₀
second	s	U.S. state and District of Columbia abbreviations	use two-letter abbreviations (e.g., AK, DC)	percent	%
Spell out year, month, and week.				probability	P
Physics and chemistry				probability of a type I error (rejection of the null hypothesis when true)	α
all atomic symbols				probability of a type II error (acceptance of the null hypothesis when false)	β
alternating current	AC			second (angular)	"
ampere	A			standard deviation	SD
calorie	cal			standard error	SE
direct current	DC			standard length	SL
hertz	Hz			total length	TL
horsepower	hp			variance	Var
hydrogen ion activity	pH				
parts per million	ppm				
parts per thousand	ppt, ‰				
volts	V				
watts	W				

FISHERY MANAGEMENT REPORT NO. 00-10

**FISHERY MANAGEMENT REPORT FOR SPORT FISHERIES IN THE
LOWER TANANA RIVER MANAGEMENT AREA FOR 1998**

by
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Division of Sport Fish

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November 2000

The Fishery Management Reports series was established in 1989 for the publication of an overview of Division of Sport Fish management activities and goals in a specific geographic area. Fishery Management Reports are intended for fishery and other technical professionals, as well as lay persons. Fishery Management Reports are available through the Alaska State Library and on the Internet: <http://www.sf.adfg.state.ak.us/statewide/divreports/html/intersearch.cfm> This publication has undergone regional peer review.

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PREFACE

The goals of the Sport Fish Division of the Alaska Department of Fish and Game are to conserve wild stocks of sport fish, to provide a diversity of recreational fishing opportunities, and to optimize social and economic benefits from recreational fisheries. In order to implement goals, the Division has in place a fisheries management process.

This report is one of a series of reports providing the 1998 update of fisheries management information about important sport fisheries within Sport Fish Division's Region III. Information is presented for the Lower Tanana River Drainage Management Area (LTMA). The report is written to make information available to the State Board of Fisheries, Fish and Game Advisory Committees, the general public, and other interested parties. It presents fisheries assessment information and the management strategies that are developed from that information. Also included are descriptions of the fisheries regulatory process, the geographic area covered and administrative, regulatory, and assessment project boundaries germane to that area. This report also details funding sources for Sport Fish Division programs, information about Fish Stocking programs, and other Sport Fish Division management programs within the Lower Tanana River Drainage Management Area.

Fisheries stock assessment research projects are developed, scheduled, and implemented to meet information needs identified by fisheries managers. Biological information gathered during the course of these research projects is combined with effort information and input from user groups and is used to assess the need for and develop fisheries management plans and propose regulatory strategies.

There is an annual Regional Area Review meeting in mid-winter during which the current status of important area fisheries is presented and research needs are identified. The area review is followed in a few weeks by a series of operational planning meetings to begin the final development and planning of the fisheries research projects that will be undertaken during the next year. New research projects and ongoing projects are considered during operational planning.

Sport Fish Division management and research activities are primarily funded by a combination of State of Alaska Fish and Game (F&G) and Federal Aid in Fisheries Restoration (D-J) monies. The F&G funds come from the sale of fishing licenses. The D-J (Dingle-Johnson, named after the congressmen who wrote the act) funds are from a Federal tax on fishing tackle and equipment. D-J funds are provided to the states at a match of up to three-to-one with the F&G funds. There is also an amendment to the D-J Act (W-B, for Wallop-Breaux) that provides money to states for boating access projects at the same three-to-one match with F&G funds. Funding Source for W-B money is a tax on boat gas and equipment. Other, peripheral funding sources can include contracts with various government agencies and the private sector.

INTRODUCTION AND BACKGROUND

REGION III DESCRIPTION

The Alaska Board of Fisheries (BOF) divides the state into ten regulatory areas for the purpose of organizing the sport fishing regulatory regime by drainages and fisheries. These areas (not to be confused with Regional management areas) are described in Title 5 of the Alaska Administrative Code (5 AAC). Sport Fish Division of the Alaska Department of Fish and Game

(ADF&G) divides the state into three administrative regions with boundaries roughly corresponding to groups of the BOF regulatory areas (Figure 1). Region I is Southeast Alaska, Region II covers portions of Southcentral Alaska, Kodiak, Southwestern Alaska, and the Aleutian Islands. Region III includes two and most of a third of the BOF fishery regulatory areas. They are the Upper Copper and Upper Susitna regulatory area, most of the Arctic-Yukon-Kuskokwim regulatory area, and the Tanana River drainage. A portion of the Arctic -Yukon-Kuskokwim regulatory area excluded from Region III and included in Region II encompasses the Kuskokwim drainage from the Aniak River downstream.

Region III is the largest region, encompassing the majority of the landmass of the state of Alaska (Figure 1). The region contains over 1,251,300 km² (485,000 mi²) of land, some of the state's largest river systems (the Yukon, portions of the Kuskokwim, the Colville, Noatak, and upper Copper River and upper Susitna River drainages), thousands of lakes, and thousands of miles of coastline and streams. Regional coastline boundaries extend from Sheldon Point in the southwest, around all of western, northwestern and northern Alaska to the Canadian border on the Arctic Ocean. Region III as a whole is sparsely populated, with the most densely populated center located in the Tanana River valley with Fairbanks (population about 31,000) being the largest community.

For administrative purposes Sport Fish Division has divided Region III into five fisheries management areas (Figure 2). They are:

- (1) The Northwestern Management Area (Norton Sound, Seward Peninsula and Kotzebue Sound drainages).
- (2) The AYK Management Area (the North Slope drainages, the Yukon River drainage except the Tanana River drainage, and the Kuskokwim River drainage upstream from the Aniak River).
- (3) The Upper Copper/Upper Susitna (UCUS) Management Area (the Copper River drainage and the Susitna River drainage above the Oshetna River), which was added to Region III in 1997.
- (4) The Upper Tanana River (UTMA) Management Area (The Tanana River drainage upstream from Banner Creek and the Little Delta River).
- (5) The Lower Tanana River (LTMA) Management Area (The Tanana River drainage downstream from Banner Creek and the Little Delta River; Figure 3).

Area offices for the five areas are located in Nome/Fairbanks, Fairbanks, Glennallen, Delta Junction, and Fairbanks, respectively.

THE ALASKA BOARD OF FISHERIES

The Alaska Board of Fisheries (BOF) is the seven-member board that sets fishery regulations and harvest levels, allocates fishery resources, and approves or mandates fishery conservation plans for the State of Alaska. Board members are appointed to 3-year terms by the Governor and must be confirmed by the legislature.

Statewide fisheries issues may be considered at any BOF meeting. Under the current operating schedule, the BOF considers fishery issues for regulatory areas or groups of regulatory areas on a three-year cycle. The BOF meetings are usually in the wintertime, between early October and late March. Regulation proposals and management plans are received for evaluation by the BOF

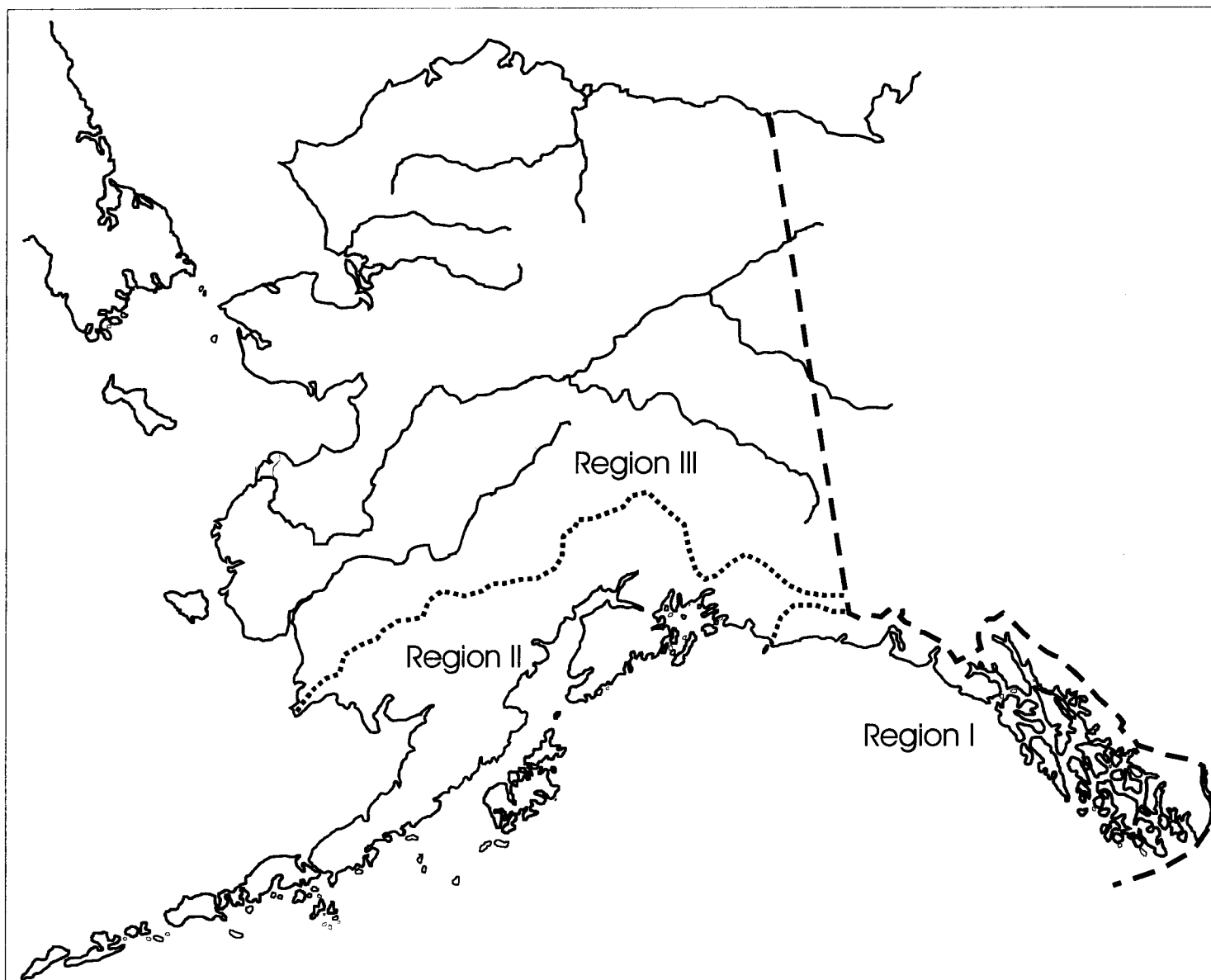


Figure 1.-Map of state with regions.

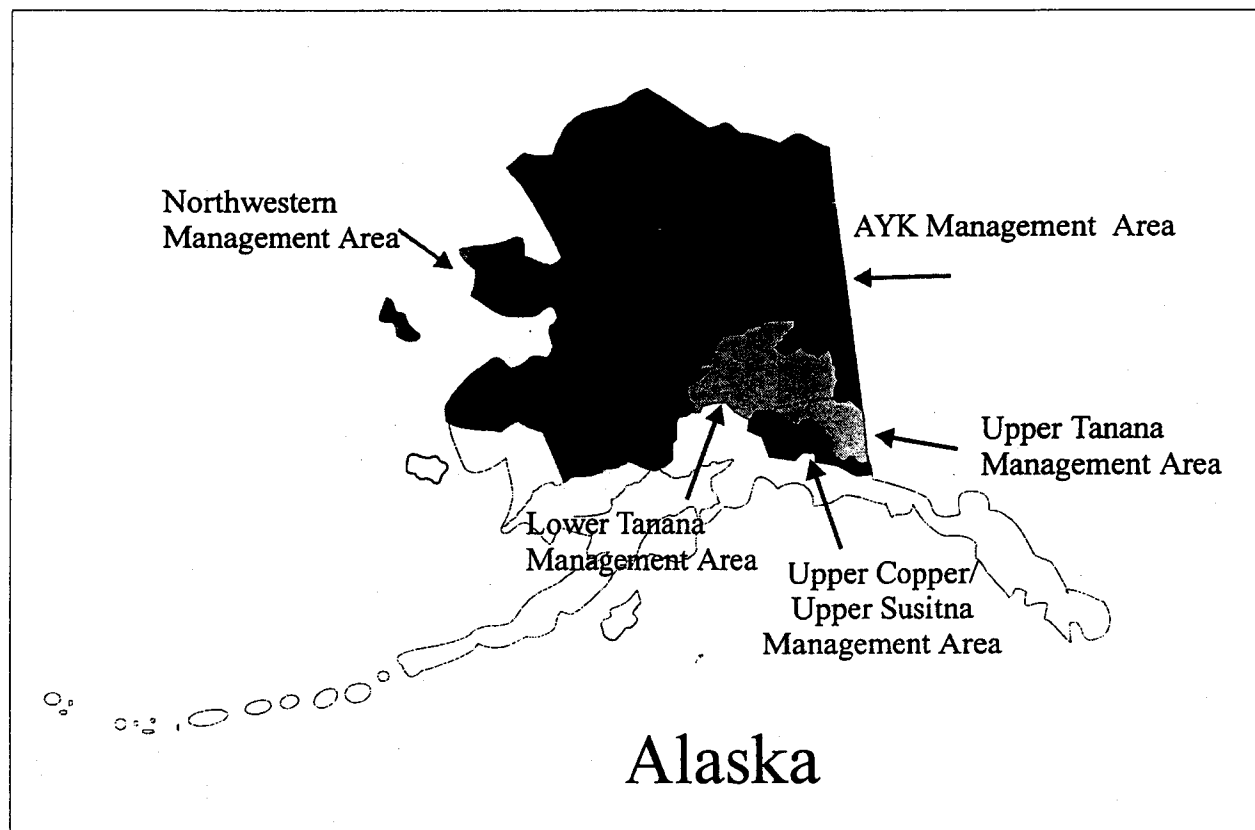


Figure 2.-Map of five management areas in Region III.

from ADF&G and the public (any Alaskan can submit a proposal to the BOF), and during its deliberations the BOF receives input and testimony through oral and written reports from staff of the Alaska Department of Fish and Game, members of the general public, representatives of local fish and game Advisory Committees, and special interest groups such as fishermen's associations and clubs.

ADVISORY COMMITTEES

Local Fish and Game Advisory committees have been established throughout the state to assist the Boards of Fish and Game in assessing fisheries and wildlife issues and proposed regulation changes. Advisory committee members are individuals from the local public who are nominated and voted on by all present during an advisory committee meeting. They serve for three years. Most active committees meet in the fall and winter on a monthly basis, usually prior to Board meetings. Advisory meetings allow opportunity for direct public interaction with department staff answer questions and providing clarification concerning proposed regulatory changes. The Boards Support Section within the Division of Administration provides administrative and logistical support for the BOF and Fish and Game Advisory Committees. During 1998, the Department had direct support responsibilities for 56 Advisory committees in the state. Jim Marcotte is the Interior Region coordinator, stationed in Fairbanks.

ADF&G EMERGENCY ORDER AUTHORITY

The ADF&G has emergency order (E.O.) authority (5 AAC 75.003) to modify time, area, and bag/possession limit regulations. Emergency orders are implemented to deal with conservation issues that arise that are not adequately controlled by existing regulations. In that scenario, E.O.s deal with the situation until it is resolved or the BOF can formally take up the issue. Emergency Orders are also the mechanism by which "in-season" management of fisheries is accomplished. In-season management is usually in accordance with a fisheries management plan approved by the BOF.

FEDERAL REGIONAL ADVISORY COUNCILS

Under ANILCA (the Alaska National Interest Lands Conservation Act) the Federal Government requires the State of Alaska to establish use of fish and game by rural residents as the top priority of possible uses, and establishes Federal rules to which the state priority must conform. This is unconstitutional under state law, which requires equal access to those resources for all citizens. Should the state not amend the constitution of the State of Alaska to implement the Federal law, managers of Federal Lands in Alaska are obligated by ANILCA to implement that priority on Federal Lands. The Constitution of the State of Alaska has not been amended.

A Federal System has been created that establishes 10 federally funded Regional Advisory Councils (RACs) providing recommendations to ensure that the rural priority for fish and game use is implemented on federal lands statewide. The RACs make recommendations to a Federal Subsistence Board, which then codifies them into Federal law. As of 1998, implementation of this system to regulate Alaska's fisheries on federal land had been delayed. RACs met to consider only wildlife use proposals.

REGION III SPORT FISH DIVISION RESEARCH AND MANAGEMENT STAFFING

The Region III Sport Fish Division staff biologists are organized into a research staff and a management staff. The management staff consists of a management supervisor, an area management biologist for each of the five management areas, one or more assistant area

management biologists, and two stocked waters biologists. The area biologists evaluate fisheries and propose and implement management strategies through plans and regulations in order to meet divisional goals and may have one or more assistants. Interaction with the BOF, Advisory Committees, and the general public is an important part of their job. The stocked waters biologists plan and implement the regional stocking program for recreational fisheries, and have one or more field assistants.

The research staff consists of a research supervisor, six research biologists (in 1998), and various field assistants. The research biologists plan and implement fisheries research projects in order to provide information needed by the management group to meet divisional goals. The duties of the management and research biologists overlap somewhat.

THE STATEWIDE HARVEST SURVEY

Recreational angling effort and catch and harvest of important sport fish species in Alaska has been estimated and reported annually by Sport Fish Division's Research and Technical Services Section (RTS) since 1977 (Mills 1979-1994; Howe et al. 1995-1999). The Statewide Harvest Survey (SWHS), a questionnaire mailed out to a random selection of sport fish license purchasers, is the instrument that provides the data analyzed to make these estimates. Estimates for a particular year usually become available in August and September of the following year. Effort, catch, and harvest are estimated on a site-specific basis, but estimates of effort directed toward a single species and the resulting species-specific catch-per-unit-effort (CPUE) information can seldom be derived from the report. Effort tables are provided in this report where the estimated effort may be species-specific. Effort is estimated as number of anglers, number of trips, and most importantly, days fished. Utility of the estimates is strongly dependant on the number of responses for a site (Mills and Howe 1992). Estimates based on 12 or less responses are useful only to document that fishing occurred. Twelve to 29 responses produce estimates useful for indicating relative order of magnitude and for assessing long-term trends, and estimates based on 30 or more responses are generally an accurate meter of harvested catch numbers.

ORGANIZATION OF THIS REPORT

This report for 1998 is organized into 18 major sections. Section I provides an overview of the Lower Tanana River Management Area. Included is a description of the management area, Board of Fisheries and other regulatory actions, management and research plans and activities within the area, issues, and access projects. Section II provides overall effort and harvest estimate data and economic information (if available) for the Management Area. Sections III - XVII are the fisheries descriptions, and Section XVIII is Appendices and References. In several cases, there are separate sections describing fisheries upon different species occurring within the same waterbody (Chena River chinook and Chena River grayling, for instance). The general description of the waterbody will be found in the **Background and Historical Perspective** section of the first section dealing with a fishery within that waterbody. Thereafter, additional description of the waterbody will appear in subsequent sections only if pertinent to that particular section. Many of the background descriptions will be derived from the introductions of Fisheries Data Series reports. Some will be fairly complete; others will be improved in subsequent annual updates of this report.

All effort, catch, and harvest information in this report is derived from the SWHS estimates cited above unless otherwise specified.

Because this report is written for a diverse readership, most units of measure are given using the English system (miles, acres, river miles, etc.). Readers conversant with and preferring the metric system should have no trouble converting the measurements mentally.

SECTION I: LOWER TANANA RIVER DRAINAGE MANAGEMENT AREA OVERVIEW

MANAGEMENT AREA DESCRIPTION

LOWER TANANA RIVER DRAINAGE MANAGEMENT AREA

After the Koyukuk Drainage, the Tanana River drainage is the second largest tributary system of the Yukon River. The Tanana River basin (Figure 3) drains an area of approximately 116,500 km² (45,155 mi²). The mainstem is a large glacial stream formed by the confluence of the Chisana and Nabesna rivers near Tok. The Tanana River flows in a generally northwest direction for some 917-km (570 miles). Much of the human population in the AYK region is located within the Tanana River drainage along the Alaska, Richardson and Parks highways, and along the road system around Fairbanks. These highways and their secondary roads provide much of the access to sport fisheries.

The Tanana River drainage is divided by Sport Fish Division into two management areas - the Upper Tanana River Drainage Management Area (UTMA, commonly called the "Delta Management Area"), and the Lower Tanana River Drainage Management Area (LTMA, commonly called the "Fairbanks Management Area"). The LTMA consists of all waters of the Tanana River drainage downstream from the Banner Creek drainage and the Little Delta River drainage on the south. Communities and municipalities located within the LTMA include Nenana, Anderson, Healy, Cantwell, Manley, Livengood, Minto, Fairbanks/Ft. Wainwright, North Pole, Eielson AFB, Salcha, Two Rivers, Chatanika, Fox, and Ester. The Fairbanks North Star Borough lies entirely within the LTMA, as does part of the Denali Borough.

Prior to 1998 this Annual Management Report (AMR) was a combined report for the entire Tanana River drainage, co-authored by the area biologists for the UTMA and the LTMA. For 1998 and in the future, separate reports will be written.

During the first eight months of this reporting period Jerry Hallberg was the Area Management Biologist for the LTMA. Jerry retired from the department in the fall of 1998 and Tim Viavant served as acting Area Manager until Mike Doxey was selected as the Area Management biologist in December 1998.

THE STATEWIDE HARVEST SURVEY APPLIED TO THE TANANA RIVER DRAINAGE

The Tanana River drainage in its entirety is included in Statistical Area U of the Statewide Harvest Survey. While most sites for which effort, catch, and harvest are estimated are clearly within one of the two management areas, a few such as the "Middle Tanana River", "Other Lakes", and "Other Streams", overlap both areas. An attempt has been made to segregate those estimates into components for each management area.

DIVERSITY OF ANGLING OPPORTUNITY WITHIN THE LTMA

Angling within the LTMA occurs at numerous lakes, ponds, and streams. Some are accessible directly from the road system. Most of these road-accessible waters have some sort of a boat launch accommodating watercraft appropriate to the size and characteristics of the waterbody.

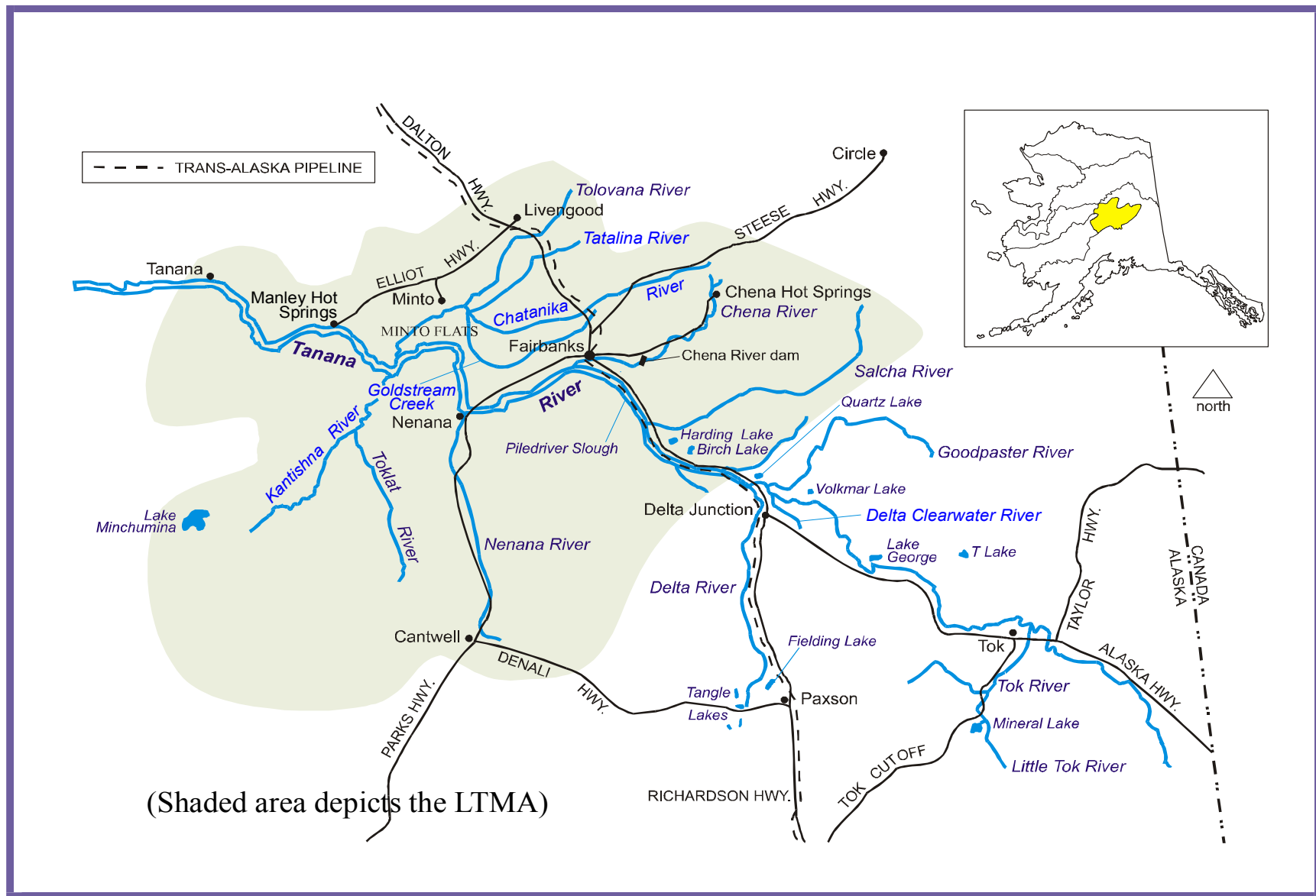


Figure 3.- Map of the Lower Tanana River Management Area (LTMA).

Access to off-road waters can be through a short walk, overland use of all terrain vehicles (ATVs), snowmachines, cross-country skis, or sled dogs (in which frozen rivers and lakes are added to the pathways), boats, and light aircraft suitable for landing on rough strips or gravel bars or equipped with floats or skis.

Fishing guides, outfitters, and transporters take anglers to areas of better quality fishing. Most such transport is by aircraft or boat. Some commercial operators provide cabins or some sort of shelter, and boats for angler use. There were no commercial operations characterizing themselves as fishing lodges in the LTMA in 1998.

Indigenous (wild stocks) and introduced (produced in hatcheries and stocked) fish are available to anglers. There are 18 fish species indigenous to the Tanana River drainage. Ten of those are commonly targeted by sport anglers, and all occur within the LTMA. They include: chinook salmon *Oncorhynchus tshawytscha*, coho salmon *Oncorhynchus kisutch*, chum salmon *Oncorhynchus keta*, Arctic grayling *Thymallus arcticus*, burbot *Lota lota*, lake trout *Salvelinus namaycush*, sheefish (inconnu) *Stenodus leucichthys*, least cisco *Coregonus sardinella*, humpback whitefish *Coregonus pidschian*, and northern pike *Esox lucius*. Dolly Varden char *Salvelinus malma*, round whitefish *Prosopium cylindraceum* and broad whitefish *Coregonus nasus* are taken occasionally by anglers. Longnose suckers *Catostomus catostomus*, Alaska blackfish *Dallia pectoralis*, lake chub *Couesius plumbeus*, slimy sculpins *Cottus cognatus* and Arctic lamprey *Lampetra japonica* are present but not targeted by anglers. Suckers and lampreys are sometimes used for bait.

Rainbow trout *Oncorhynchus mykiss* are not native to the drainage, but have been stocked in many locations. Arctic char *Salvelinus alpinus*, coho salmon, chinook salmon, Arctic grayling, and lake trout are also stocked in selected waters of the Tanana River drainage.

Angling opportunity is available year-round. Fishing may occur in all waters where game fish are present during the summer. Winter effort focuses on stocked lakes, with some effort directed toward lake and river populations of burbot and northern pike.

REGULATIONS AND REGULATORY ACTIONS

Area Regulations (for the LTMA)

Regulations for the Tanana drainage sport fisheries are codified in Chapters 70 and 75 of Title 5 of the Alaska Administrative Code (5 AAC 70 & 5 AAC 75). Along with appropriate Statewide Regulations and other information they are summarized and simplified in a sport fishing regulation booklet for distribution to the angling public.

Appendix A contains a version of the general sport fishing regulations for the Tanana River drainage and the specific regulations that apply to the LTMA. Most statewide regulations are not included. **The version of the regulations appearing in this report have been edited to remove references to and regulations for the Upper Tanana River Drainage Management Area (UTMA) and are included in this report to provide reference to fisheries management actions and regulation changes in the LTMA in this and in future reports. Under no circumstances should they be copied from this report and used as a reference by anglers.**

1998 REGULATORY ACTIONS AND ANTICIPATED FUTURE ACTIONS

In 1998, Emergency Order 3-WF-03-96 remained in effect (Table 1). Issued on 8/30/96, it closed the Chatanika River to the retention of whitefish. Whitefish stocks in the Chatanika River had not recovered such that they could sustain a harvest.

On 7/23/98, restricting the chinook salmon fishery in the Chatanika, Chena, and Salcha rivers to catch and release only through 8/15/98. The E.O. was precipitated by a Yukon River chinook salmon run that was later and smaller than normal. Indicators (tower counts, catches in the mainstem of the Tanana River) suggested that the Tanana drainage component of the Yukon River chinook salmon run was similarly depressed.

Because chum salmon stocks were similarly depressed, Emergency Order 3-CS-04-98 was issued closing sport fishing for chum salmon throughout the Yukon River drainage, including the Tanana River drainage, through October 1, 1998.

Table 1.-Emergency orders issued for Lower Tanana River Management Area sport fisheries from 1995 to 1998.

Year	E. O. Number	Explanation
1995	3-WF-03-95	Closure of Chatanika River to whitefish sport fishing.
1996	3-AG-01-96	Closes Piledriver Slough and 23 Mile Slough to the retention of Arctic grayling.
1996	3-WF-03-96	Closes the Chatanika River to whitefish sport fishing.
1998	3-S-03-98	Restricts Chena, Salcha, and Chatanika rivers to Catch and Release for Chinook and Chum Salmon.
1998	3-CS-04-98	Closes Chum Salmon sport fishing throughout Tanana Drainage

STATE BOARD OF FISHERIES

The two most recent meetings of the Alaska Board of Fisheries to consider regulatory issues pertaining to the AYK regulatory area and the Tanana River drainage took place in Anchorage during November 8 - 18, 1994 and in Fairbanks during December 2-9, 1997. During the 1994 meeting the BOF took three actions specific to the LTMA. They adopted regulations designed to establish Little Harding Lake as a fishery for large rainbow trout; they standardized the opening date at June 1 for the LTMA grayling fisheries subject to spring catch and release restrictions; and they extended the 12 inch minimum harvest length limit for grayling to cover the entire Chatanika River drainage. During the 1997 meeting the BOF actions specific to the LTMA were: to adopt a Minto Flats Northern Pike Management Plan; to extend the season for northern pike fishing on certain remote lakes; and to align the area of the Chatanika River closed to chum salmon fishing with the area closed for chinook salmon fishing.

The next BOF meeting to address proposals regarding Tanana drainage sport fisheries is scheduled for January 2001, in Anchorage. Lower Tanana Drainage Management Area issues that will likely be addressed at that meeting include a Chena River Grayling Management Plan and a decline in abundance of the Harding Lake northern pike population.

FISH AND GAME ADVISORY COMMITTEES

A total of four Advisory Committees represent resource users in the LTMA: Fairbanks, Minto/Nenana, Middle Nenana River, and Lake Minchumina. During 1998 Region III Sport Fish Division staff attended meetings of the Fairbanks and Minto/Nenana Advisory Committees. Little activity other than routine fisheries updates took place because 1998 was at the beginning of the three-year BOF cycle, with the 1997 BOF meeting just completed.

FEDERAL SUBSISTENCE

The LTMA lies within the boundaries of the Eastern Interior Regional Advisory Council (EIRAC). There is a very small proportion of Federal Land outside of parklands within the LTMA that is within the jurisdiction of the EIRAC. The RACs had no authority to take up fisheries issues in 1998.

MANAGEMENT PLANS

The Region III management staff began drafting Fishery Management Plans in 1992 for important fisheries. The plans went through a public review and comment process and were finalized. With the exception of the Minto Flats Northern Pike Management Plan, none of these plans involved specific management strategies requiring new regulations or BOF action. Finalized plans are subject to revision. None of the plans have been formally reviewed and revised, although some in-house revisions of plans for stocked lakes have occurred and some management strategies have been changed by the division or BOF outside of the written management plan process. Managers use the plans as planning and evaluation tools, but the utility of the plans can decline as time passes without review and updating.

The title, year of publication, species and waterbody objectives, and review plans are as follows:

- I. Birch Lake Sport Fishery Enhancement, June 1992 (Amended periodically).
 - A. Objectives:
 1. Provide 15,000 annual angler days or more of sport fishing effort.
 2. Provide diverse sport angling opportunities through the annual or alternate year stocking of rainbow trout, coho salmon, Arctic char, and Arctic grayling.
 3. Maintain an annual mean catch rate in excess of two sport fish per angler-day while allowing anglers to keep the portion of the catch they so desire.
 - B. Review: Annually, as part of the review of the development of the Statewide Stocking Plan for Recreational Fisheries.
- II. Chena Lake Sport Fishery Enhancement, June 1992 (Amended periodically).
 - A. Objectives:
 1. Provide 10,000 annual angler days or more of sport fishing effort.
 2. Provide diverse sport angling opportunities through the annual or alternate year stocking of rainbow trout, coho salmon and /or chinook salmon, Arctic char, and Arctic grayling.

3. Maintain an annual mean catch rate in excess of two sport fish per angler-day while allowing anglers to keep the portion of the catch they so desire.
 - B. Review: Annually, as part of the review of the development of the Statewide Stocking Plan for Recreational Fisheries.
- III. Piledriver Slough Sport Fishery Enhancement, June 1992 (Amended periodically).
- A. Objectives:
1. Ensure that incidental mortality of Arctic grayling and that harvest and incidental mortality of other naturally occurring species is sustainable. Fishing mortality on the Arctic grayling population should not exceed 20% annually.
 2. Provide 10,000 or more days of recreational fishing annually on a streamside rainbow trout fishery.
 3. Maintain an annual mean catch rate in excess of two sport fish per angler-day while allowing anglers to keep the portion of the catch of rainbow trout they so desire.
- C. Review: Annually, as part of the review of the development of the Statewide Stocking Plan for Recreational Fisheries.
- IV. Fisheries Management Plan for Small Lakes in the Tanana Valley, June 1992 (Amended periodically).
- A. Objectives:
1. Manage important native populations of fish according to sustained yield principles.
 2. Provide a combined 20,000 days of sport fishing effort (angler days).
 3. Provide sport angling diversity through annual or alternate-year stocking of multiple species of sport fish.
 4. Publicize the fishing opportunities available to anglers.
 5. Improve public access where needed.
 6. Manage three small stocked lakes (Little Harding Lake, Craig Lake, and Coal Mine # 5) to provide catch and release and/or limited harvest opportunities for larger than average rainbow trout. *Coal Mine #5 Lake and Craig Lake are in the UTMA but are listed here to collectively describe the management program for larger rainbow trout.*
- B. Review: Annually, as part of the review of the development of the Statewide Stocking Plan for Recreational Fisheries.
- V. Chatanika River Sport Fishery Management Plan, November 1992.
- A. Objectives:

1. To ensure that harvests and incidental mortality of Arctic grayling, whitefish, sheefish, northern pike, burbot, chinook salmon and chum salmon are sustainable.
 2. To increase participation in the recreational fishery from current levels to 15,000 angler-days per year by 1995.
 3. To ensure that public benefits derived from this fishery outweigh the costs of fishery management.
- B. Review: Formal review of the plan is unscheduled as of 1998, but the status of selected fisheries is reviewed annually during the Area Management Review meeting, and a Minto Flats Northern Pike Management Plan was adopted by the BOF in 1997.

VI. East Twin Lake Sport Fishery Management Plan, April 1993.

A. Objectives:

1. To ensure that harvests and incidental mortality of northern pike by the recreational fishery are sustainable.
2. To allow the fishery to approximately double from the average 1988-1991 level.
3. To ensure that public benefits derived from this fishery outweigh the costs of fishery management.

- B. Review: Formal review of the plan is unscheduled as of 1998, but the status of selected fisheries is reviewed annually during the Area Management Review meeting..

VII. Minto Flats Sport Fishery Management Plan, April 1993.

A. Objectives:

1. To ensure that harvests and incidental mortality of northern pike by the recreational fishery are sustainable.
2. To manage the fishery in a manner that allows the fishery to rebuild to the average level that occurred during the 1970's (about 3,000 angler days per year).
3. To maintain public access to Minto Flats for the benefit of recreational anglers.
4. To ensure that public benefits derived from this fishery outweigh the costs of fishery management.

- B. Review: Formal review of the plan is unscheduled as of 1998, but the status of selected fisheries is reviewed annually during the Area Management Review meeting, and a Minto Flats Northern Pike Management Plan was adopted by the BOF in 1997 that set out more specific harvest and regulatory guidelines.

VIII. Recreational Fishery Management Plan for Chinook Salmon in the Chena River, May 1993.

A. Objectives:

1. To ensure that harvests and incidental mortality of chinook salmon in the Chena River fishery are sustainable. *Within the text of the plan escapement goals and the BOF mandated guideline harvest is described.*
2. To maintain current levels of fishing opportunity in the Chena River chinook salmon fishery.
3. To ensure that public benefits derived from this fishery outweigh the costs of fishery management.

B. Review: Formal review of the plan is unscheduled as of 1998, but the status of selected fisheries is reviewed annually during the Area Management Review meeting.

IX. Recreational Fishery for Chinook Salmon in the Salcha River, May 1993.

A. Objectives:

1. To ensure that harvests and incidental mortality of chinook salmon in the Salcha River fishery are sustainable. *Within the text of the plan escapement goals and the BOF mandated guideline harvest is described.*
2. To maintain current levels of fishing opportunity in the Salcha River chinook salmon fishery.
3. To ensure that public benefits derived from this fishery outweigh the costs of fishery management.

B. Review: Formal review of the plan is unscheduled as of 1998, but the status of selected fisheries is reviewed annually during the Area Management Review meeting..

X. Recreational Fishery Management Plan for Arctic Grayling in the Salcha River, June 1993.

A. Objectives:

1. To ensure that harvests of grayling and other fish species by anglers are sustainable.
2. To manage the Salcha River grayling fishery in a manner that will provide an average of 7,500 angler-days of fishing effort per year.
3. To ensure that public benefits derived from this fishery outweigh the costs of fishery management.

B. Review: Formal review of the plan is unscheduled as of 1998, but the status of selected fisheries is reviewed annually during the Area Management Review meeting..

- XI. Harding Lake Sport Fishery Management Plan, June 1993 (Amended periodically).
- A. Objectives:
1. Manage indigenous stocks of northern pike and burbot at sustainable levels.
 2. Manage the non-indigenous, but reproducing stock of lake trout within sustainable levels, and begin stocking catchable lake trout.
 3. Provide increased diversity of recreational angling opportunity through the annual stocking of Arctic char.
- B. Review: Annually, as part of the review of the development of the Statewide Stocking Plan for Recreational Fisheries.
- XII. Tanana River Burbot Sport Fishery Management Plan, June 1993 (*Includes both the UTMA and LTMA*).
- A. Objectives:
1. To ensure that harvests and incidental mortality of burbot by the recreational fishery are sustainable.
 2. To manage the Tanana River fishery in a manner that allows the fishing effort to rebuild to an average level of approximately 10,000 angler days per year.
 3. To maintain public access to the Tanana River for the benefit of recreational anglers.
 4. To ensure that public benefits derived from this fishery outweigh the costs of fishery management.
- B. Review: Formal review of the plan is unscheduled as of 1998, but the status of selected fisheries is reviewed annually during the Area Management Review meeting.
- XIII. Chena River Arctic Grayling Conservation and Rehabilitation Plan, December 1993.
- A. There is no specific list of "objectives" within this plan. Objectives can be derived from the text. In summary, the objective of the project was to increase grayling abundance to a level capable of sustaining a harvest of 10,000 fish in the Chena River by 1995.
- B. Review: The project was terminated. Review of the general status of Chena River Arctic grayling is conducted annually during the Area Management Review meeting.

XIV. Minto Flats Northern Pike Management Plan, December 1997.

- A. This plan was adopted by the BOF in 1997 to address conservation concerns. The objective is to ensure that the maximum exploitation rate of northern pike in Minto Flats for all users may not exceed 20% annually.
- B. Review: The plan may be reviewed during the Area Management Review meeting and during BOF meetings.

SECTION II: LOWER TANANA RIVER DRAINAGE MANAGEMENT AREA OVERALL EFFORT AND HARVEST DATA AND ECONOMIC INFORMATION

DATA MANAGEMENT

In preparation for the development of this report, SWHS estimates of effort, catch, and harvest for the entire Tanana River drainage were segregated into separate sets of estimates for the UTMA and LTMA. The beginning of timelines for estimates presented in this report vary depending on when it was possible to sensibly break out the LTMA information. Some begin with the first reported estimates in 1977. Many begin in 1983, when increasingly detailed estimates became available covering more individual waters. In 1990 both catch and harvest estimates were produced (for 1977 - 1989 only harvest was evaluated). Because of this and the relevance to the present status of the fisheries or more recent estimates, considerable emphasis is placed on estimates from 1990 to present. Some estimates may differ slightly from SWHS reported results because of computational modifications when the segregation was undertaken.

SPORT ANGLER EFFORT IN THE LTMA

Due to a computational problem (discovered in 1999), estimates of effort, catch, and harvest for 1995, 1996, 1997, and 1998 produced by RTS were incorrect. Based on preliminary analysis of the problem, reported effort was about 20% higher than the true estimates, and catch and harvest estimates were impacted inconsistently, with some artificially high, some low, and some unchanged. As this report is being written (in summer 2000) there is an ongoing project to correct the errors. All of the tables within this report detailing effort, catch, and harvest contain some erroneous information for 1995, 1996, 1997, and 1998, and are useful only as broad trend indicators. The tables containing errors in 1996, 1997, and 1998 estimates are labeled as "Provisional". The electronic file containing data for 1995 was lost and the data will never be corrected.

From 1988 through 1997, anglers in the LTMA have expended an average of 118,683 angler-days (about 5% of the total statewide effort; Table 2). The provisional five year average effort for the LTMA (119,954 angler days) is about 49% of the provisional five-year average for Region III. The heavy contribution of LTMA fisheries to Region III effort totals is a function of higher human population density in the Tanana River valley. There are drainages within Region III where sport fish species are more abundant than within the LTMA.

The transfer of authority over the Upper Copper/Upper Susitna Management Area (UCUS) from Region II to Region III (RIII) in 1997 caused a decline in the proportion of total effort, catch, and harvest that the other management areas contributed to the overall Region III production.

Table 2.-Number of angler days of sport fishing effort expended by recreational anglers fishing LTMA waters, 1983-1998 (Provisional).

Year	LTMA Effort	Statewide Effort	LTMA Percent of Statewide	Region III Effort	LTMA Percent of Region III
1983	103,153	1,732,528	6%	199,125	52%
1984	103,868	1,866,837	6%	199,041	52%
1985	91,338	1,943,068	5%	186,883	49%
1986	103,885	2,071,412	5%	194,713	53%
1987	106,654	2,152,866	5%	217,109	49%
1988	126,135	2,311,291	5%	233,559	54%
1989	139,223	2,264,079	6%	239,626	58%
1990	133,365	2,453,284	5%	245,629	54%
1991	106,959	2,456,328	4%	219,922	49%
1992	81,378	2,540,374	3%	181,852	45%
1993	103,713	2,559,408	4%	220,972	47%
1994	99,906	2,719,911	4%	239,626	42%
1995	141,231	2,787,670	5%	270,141	52%
1996	159,027	2,733,008	6%	274,566	58%
1997	95,891	2,654,454	4%	311,390	31%
1998	83,430	2,154,868	4%	272,574	31%
Total - 1983-1998	1,821,397	37,401,386	4%	3,706,728	48%
Average 1983-1998	111,197	2,337,587	5%	231,671	48%
10 year Average 1988-1997	118,683	2,547,981	5%	243,728	49%
5 Year Average 1993-1997	119,954	2,690,890	5%	263,339	46%

Effort in the LTMA may be trending downward (Figure 4).

Sport Fish Harvest

From 1983 through 1998, anglers in the LTMA harvested an estimated 1,273,618 fish, accounting for an average of 3% of the annual estimated statewide recreational fish harvest and about 41% of the total estimated Region III harvest for the same period (Table 3). More will be said about the relationship between LTMA, Region III, and Statewide harvest in a forthcoming report when corrected estimates are available.

The proportion of the LTMA harvest within the total Region III harvest declined due to the addition of the UCUS Area to Region III in 1997. An overall declining trend since 1990 seems to be appearing. Restrictive regulations are partially responsible for the declines in Tanana drainage harvests, but it must be remembered that those regulations are in place to conserve stocks that were observed to be declining. Had regulations not been implemented, harvest would have likely declined in any case with the probable continued decline in the stocks. Another possible reason for declines in harvest is the growing angler preference to release their catch. During the period 1993 - 1997, rainbow trout, Arctic grayling, northern pike, and landlocked salmon (in that order) dominated the harvest in the LTMA (Table 4). Increases in the harvest of chinook salmon in the 1990's reflect increasing angler interest in the fisheries.

HARVEST AS A PROPORTION OF CATCH

Estimates of catch (which includes both harvested and released fish) first appeared in the SWHS in 1990. The overall harvest rate appears to be declining over time (Table 5). Catch and harvest data for 1998 (Table 6) and historic harvest data (Table 4) indicate that grayling are major contributors to this decline, with high catch rates and a decreasing proportion harvested. Grayling provided 58% of the total catch for 1998 while only 3% were harvested.

Restrictive regulations account for some of the declining proportion of catch that is harvested. Other factors include a general trend among anglers to voluntarily release a higher proportion of their catch where harvest is allowed, and in some cases lower availability of larger fish that might be preferred for harvest. For example, rainbow trout stocked as catchables often fall below the target size at stocking for that species. Burbot and whitefish sustain higher harvest rates because they are primarily targeted for consumption (and bait, in the case of whitefish).

ECONOMIC VALUE OF SPORT FISHERIES

Sport fisheries in the LTMA provide year-round economic benefits. The fish-stocking program is a critical contributor, since without the availability of stocked salmonids in lakes, there would be very little winter fishing. Eight major department stores in the Fairbanks area and on the military bases sell fishing tackle. There are three shops that specialize in fishing gear, and many supermarkets and roadside businesses away from the urban area have small fishing tackle sections. Seven companies advertise fishing charters, and there are other, smaller charter operators in the area. Peripherally, economic benefits are produced by sales of products ranging from transportation equipment used partially or totally for fishing (boats, motors, ATVs, snowmachines, aircraft, and the associated service, repair and accessory industries) through such items as ice augers and ice chisels sold at hardware stores. Fuel and supplies used for fishing trips are also purchased locally.

Based on an as-yet unpublished table correcting harvest and effort for 1998, about 23,000 anglers fished in the LTMA in 1998. On a statewide basis in 1998 about 41% of the anglers were

Lower Tanana Management Area Estimated Angler Effort 1983 - 1998

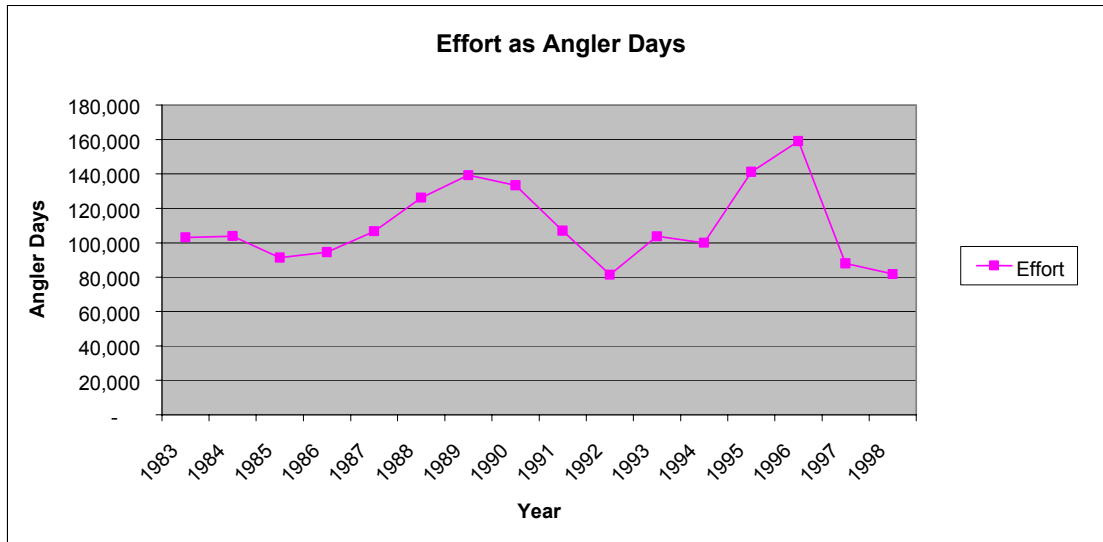


Figure 4.-Total angler effort in the LTMA, 1983 – 1998.

Table 3.-Number of fish harvested by recreational anglers from LTMA waters, 1983-1998 (Provisional).

Year	LTMA Harvest	Statewide Harvest	LTMA % of Statewide	Region III Harvest	LTMA % of Region III
1983	109,547	3,086,280	4%	274,086	40%
1984	121,755	3,115,966	4%	245,083	50%
1985	105,453	3,096,044	3%	241,109	44%
1986	97,155	3,163,433	3%	216,826	45%
1987	90,174	3,207,138	3%	201,677	45%
1988	113,150	3,483,306	3%	264,371	43%
1989	119,605	3,213,867	4%	253,437	47%
1990	75,186	3,033,301	2%	174,175	43%
1991	83,453	3,311,513	3%	221,164	38%
1992	53,216	3,234,048	2%	131,486	40%
1993	60,278	2,989,720	2%	151,551	40%
1994	47,080	3,350,415	1%	152,676	31%
1995	59,252	2,909,979	2%	118,473	50%
1996	58,414	3,336,773	2%	137,479	42%
1997	39,542	3,294,273	1%	140,473	28%
1998	40,358	3,125,941	1%	181,808	22%
Total – 1983-1998	1,273,618	50,951,997	3%	3,105,874	41%
Average 1983-1998	79,601	3,184,500	3%	194,117	41%
10 year Average 1988-1997	70,918	3,215,720	2%	174,529	41%
5 Year Average 1993-1997	52,913	3,176,232	2%	140,130	38%

Table 4.-Number of fish harvested, by species, by recreational anglers from LTMA waters, 1983-1998 (Provisional).

Year	Salmon			Resident Species								
	Chinook	Coho	Chum	Landlocked Salmon	Rainbow Trout	Lake Trout	Char ^a	Grayling	Northern Pike	Whitefish	Burbot	Sheefish
1983	992	84	582	10,048	18,009	31	212	60,748	7,898	7,436	3,350	157
1984	338	158	351	11,929	26,296	559	13	61,560	6,357	10,742	3,131	320
1985	1,356	25	1023	1,4278	20,150	46	1,171	36,711	8,824	18,840	3,566	385
1986	788	281	496	7,165	15,967	45	37	30,398	8,112	26,995	6,618	53
1987	492	0	578	9,984	19,865	109	30	24,723	6,105	25,937	2,128	223
1988	399	461	236	11603	43,398	279	418	36,489	7,599	9,123	1922	770
1989	460	493	969	8,490	39,685	567	682	39,407	8,310	16,688	2,969	403
1990	420	269	50	6,566	35,377	226	557	17,732	5,414	6,299	2,207	68
1991	630	443	385	10,604	40,039	461	909	18,503	9,426	551	1,323	158
1992	118	198	373	6,836	20,164	380	1,597	8,275	9,426	3,140	2,368	148
1993	1,691	29	317	5,976	27,976	412	3,536	11,377	4,200	948	3,547	164
1994	1,832	539	244	3,645	17,014	117	1,129	11,826	7,743	242	2,551	163
1995	2,419	593	1,207	3,445	21,066	621	2,423	13,217	10,581	469	2,936	200
1996	3,095	348	1,731	5,094	34,382	271	1,963	5,073	4,890	149	1,378	40
1997	1,948	334	455	5,889	20,517	318	1,769	8,520	3,181	774	4,048	33
1998	482	125	64	4,872	20,038	78	2,688	6,160	2,180	450	2,073	27
Total -1983-1998	17,460	4,380	9,061	126,424	416,943	4,520	19,134	390,718	110,246	128,783	45,115	3,312
Average 1983-1998	1,091	274	566	7,902	26,246	282	1,196	24,420	6,890	8,049	2,882	207
10 year Average 1988-1997	1,301	371	597	6,815	29,962	365	1,498	17,042	7,077	3,838	2,525	215
5 Year Average 1993-1997	2,197	369	791	4,815	24,191	348	2,164	10,003	6,119	516	2,892	120

^a Includes Arctic char and Dolly Varden.

Table 5.-Percentage of fish caught that were harvested by anglers from LTMA waters, 1993-1998, with 5-year averages (Provisional).

Species	1993	1994	1995	1996	1997	5 Yr Avg	1998
<u>Salmon:</u>							
Chinook	34%	70%	43%	36%	32%	43%	26%
Coho	11%	38%	59%	16%	27%	30%	18%
Chum	15%	22%	44%	21%	19%	24%	5%
<u>Resident Species:</u>							
Landlocked Salmon	60%	37%	34%	37%	29%	40%	23%
Rainbow Trout	34%	32%	32%	30%	31%	32%	25%
Lake Trout	51%	39%	38%	32%	27%	37%	7%
Char ^a	43%	25%	37%	21%	33%	32%	42%
Arctic Grayling	9%	7%	15%	4%	4%	8%	3%
Northern Pike	19%	17%	25%	14%	12%	17%	8%
Whitefish	34%	34%	49%	23%	37%	35%	36%
Burbot	85%	81%	71%	71%	87%	79%	71%
Sheefish	86%	61%	41%	18%	27%	47%	14%
Total	40%	21%	25%	18%	18%	24%	11%

^a Includes Arctic char and Dolly Varden char.

Table 6.-Angler catch and harvest from LTMA waters during 1998 (Provisional).

Species	Catch ^b	Harvest	Percent Harvested
Salmon:			
Chinook	1,826	482	26
Coho	647	119	18
Chum	1,175	64	5
Resident Species:			
Landlocked Salmon	21,095	4,872	23
Rainbow Trout	80,368	20,038	25
Lake Trout	1,181	78	7
Char ^a	6,454	2,688	42
Arctic Grayling	203,573	6,160	3
Northern Pike	28,489	2,180	8
Whitefish	1,258	450	36
Burbot	2,900	2,073	71
Sheefish	196	27	14
Total	349,162	39,231	11

^a Includes Arctic char

^b Catch = Total (number released + number harvested).

residents (Howe et al. 1999). The proportion is likely higher in the LTMA. cursory examination of creel census reports written in the late 1980s and early 1990s indicate that over 90% of the anglers in some popular fisheries were residents. Resident fishing licenses cost \$15, and the cheapest non-resident license is \$10. The 23,000 anglers fishing in the LTMA in 1998 generated a minimum of \$277,000 in license fees, less whatever proportion had the free license for those over 60 years of age and in addition to whatever proportion purchased the \$10 King Salmon Stamp.

Inferences concerning the economic value of LTMA fisheries can be derived from an as-yet unpublished FDS report entitled Region III Angler Survey: Use and Valuation Estimates for 1996, with a Focus on Arctic Grayling Fisheries produced by, Duffield, Neher and Merritt (1999). Willingness to pay per trip (WTP) estimates were developed for selected fisheries and components of fisheries within Region III. While all expanded results ([WTP] x [number of trips to that fishery in 1995 and 1996]) are provisional, and the 1995 results cannot ever be corrected due to the lost data file, the reported expanded results are likely representative of the true values (P. Merritt, Alaska Dept. of Fish and Game, Fairbanks, personal communication). WTP by residents for all species combined for the segment of Region III dominated by Tanana Valley anglers was about \$122. Number of trips (provisional) within the LTMA in 1996 was about 117,000. Expanded potential net economic value was about \$14,274,000.

SECTION III: CHENA RIVER CHINOOK SALMON FISHERY

BACKGROUND AND HISTORICAL PERSPECTIVE

The Chena River is a clear-water tributary to the Tanana River originating in the Tanana Uplands 90 miles east of Fairbanks. The river flows approximately 160 river miles from the uppermost reach in the East (Middle) Fork to the confluence with the Tanana River at Fairbanks. The watershed is about 2,000 mi², and includes five major tributaries: North Fork, West Fork, South Fork, East (Middle) Fork, and the Little Chena River. Collectively, these major tributaries and the mainstem are over 290 miles in length. Urban development is extensive along the lower 25 river miles.

The Chena River is road-accessible along a long section of the upper river paralleled by the Chena Hot Springs Road (CHSR) beginning at mile 25 CHSR (river mile 71). Road access is also plentiful along the lower reaches flowing through the Badger Road area, Ft. Wainwright, and the City of Fairbanks. A section between the Badger Road area and river mile 71 has limited road access. Powerboats can navigate throughout the mainstem downriver from the confluence of the North Fork Chena River and the East (middle) Fork, and can travel a short distance up the East Fork Chena and South Fork Chena rivers. Reaches of the Chena River upriver of areas accessible by powerboat or by roads and trails are utilized by floaters in canoes and inflatable boats. All areas downstream of the farthest upstream road accessible spot are also very popular with the floaters.

There is a flood control project (the Chena River Lakes Flood Control Project) at river mile 45 consisting of a dam, long dikes, and a floodway upstream from the dam constructed south to the Tanana River near Moose Creek. The dam allows the water to flow freely at normal velocities through three floodgates except when the river is high and there is flood danger to property downstream. Fish passage is unimpeded until the flow exceeds 8,000 cfs and the floodgates are partially closed to maintain that flow. Water is diverted along the floodway to the Tanana River.

The floodgates have seldom been lowered while adult chinook salmon were passing through the structure, and then only for short periods of time. There is a fishway built into the side of the structure that is designed to allow fish passage if a large volume of water is backed up behind the dam. Because the water rarely gets high enough to flow down the fishway, its potential to pass migrating salmon is essentially untested.

The Chena River supports populations of: Arctic grayling *Thymallus arcticus*, chinook salmon *Oncorhynchus tshawytscha*, chum salmon *O. keta*, round whitefish *Prosopium cylindraceum*, humpback whitefish *Coregonus pidschian*, least cisco *C. sardinella*, northern pike *Esox lucius*, burbot *Lota lota*, longnose suckers *Catostomus catostomus*, slimy sculpins *Cottus cognatus*, lake chubs *Couesius plumbeus*, Arctic lamprey *Lampetra japonica*, and a few sheefish *Stenodus leucichthys*. Grayling, salmon, whitefish, pike, burbot, and sheefish are taken in the sport fishery.

There has been a chinook salmon sport fishery at the Chena River since before statehood. It remained relatively small throughout the 1980s. Estimated harvests between 1977 and 1992 ranged from 0 to 375 fish, then increased dramatically in the mid - 1990s (Table 7). The 5-year average catch (1993-1997) is 2,264 and harvest was 941. While run strength and river conditions can override effort in determining catch and harvest, the harvest potential of this fishery is likely increasing due to a combination of increased public awareness of its availability and improvements in the gear and fishing techniques used to target chinook salmon. Chinook fisheries in the LTMA occur almost entirely during the month of July. The fishery on the Chena River is closed above the Chena River Flood Control Project (the dam) at river mile 45. Most of the spawning occurs above the dam.

The chinook salmon fishery on the Chena River is road-accessible in numerous places through the communities of Fairbanks, Ft. Wainwright, and North Pole, and at the dam. There are several public and many private boat launches along the road accessible areas of the river, including one at the dam. Anglers targeting chinook salmon from boats tend to focus on the confluence of the Chena and Tanana rivers and some pools in the lower river through Fairbanks, and at the confluence of the Chena and Little Chena rivers. Those fishing from shore are scattered along the road accessible areas, with concentrations at Ft. Wainwright and at public use areas at the Nordale Road bridge and the dam.

Chinook salmon escapement to the Chena River was estimated by aerial survey by Commercial Fisheries Division from 1974 through 1998, and by either mark-recapture experiments or counting tower operations or both by Sport Fish Division since 1986. Regulations for chinook salmon in the Tanana River drainage have remained unchanged since the early 1960s, at one per day, one in possession. The fishery in the Chena was closed by emergency order in 1987 and 1992. Because of large returns, the bag limit was increased to two fish by emergency order in 1993 and 1994.

Estimated chinook salmon escapement abundance (as opposed to aerial survey counts) between 1987 and 1997 ranged from less than 2,700 to over 13,000 for the Chena River (Table 7). The 5-year average (1993 - 1997) was 10,582 fish.

RECENT FISHERY PERFORMANCE (1998 SUMMARY)

Estimates of escapement abundance and length, age, and sex composition of chinook salmon were conducted on the Chena River during July and August of 1998. Poor run strength

Table 7.-Catch, harvest, and abundance of chinook salmon from the Chena, Salcha, and Chatanika, rivers, 1977 to 1999 (Provisional).

Year	Chena River			Salcha River			Chatanika River	
	Catch	Harvest	Abundance	Catch	Harvest	Abundance	Catch	Harvest
1977	N/A ^a	29	NA	NA	62	NA	NA	9
1978	NA	23	NA	NA	105	NA	NA	35
1979	NA	10	NA	NA	476	NA	NA	29
1980	NA	0	NA	NA	904	NA	NA	37
1981	NA	39	NA	NA	719	NA	NA	5
1982	NA	31	NA	NA	817	NA	NA	136
1983	NA	31	NA	NA	808	NA	NA	147
1984	NA	0	NA	NA	260	NA	NA	78
1985	NA	37	NA	NA	871	NA	NA	373
1986	NA	212	9,065	NA	525	NA	NA	0
1987	NA	195	6,404	NA	244	4,771	NA	21
1988	NA	73	3,346	NA	236	4,562	NA	345
1989	NA	375	2,666	NA	231	3,294	NA	231
1990	406	64	5,603	680	291	10,728	164	37
1991	258	110	3,025	515	373	5,608	181	82
1992	71	39	12,241	86	47	7,862	31	16
1993	2,545	733	11,877	1,788	601	10,007	625	192
1994	1,308	993	9,680	971	714	18,399	278	105
1995	1,095	662	7,153	4,091	1,448	13,643	134	58
1996	3,692	1,280	10,811	3,298	1,136	7,570	1,164	499
1997	2,680	1,037	13,390	2,238	715	18,514	425	345
1998	889	299	4,745	600	121	5,027	39	6
1999	NA	NA	6,845	NA	NA	9,198	NA	NA
Averages								
1977-97	NA	285	NA	NA	532	NA	NA	127
1990-97	1,507	615	9,223	1,708	666	11,541	375	167
1993-97	2,264	941	10,582	2,477	923	13,627	525	240

^a NA = not available.

indicators for chinook for the entire Yukon drainage and poor escapement estimates for the Chena River through July 14th precipitated an Emergency Order restricting fishing for chinook salmon to catch-and-release only, on that date. Estimated catch for 1998 was 889 and harvest was 299 fish.

The final escapement estimate for the 1998 Chena River chinook return was below the escapement goal set in the current management plans for these fisheries. The estimated escapement was 4,745 (SE = 503), about 25% below the escapement goal of 6,300 fish (Stuby and Evenson 1999) and 45% below the 5-year average.

FISHERY MANAGEMENT OBJECTIVES

The Chena River chinook salmon sport fishery is managed under a management plan with an escapement goal and a guideline harvest allocation for the sport fishery. An escapement goal based on aerial surveys was set by Commercial Fisheries Division in 1992 at 1,700 fish for the Chena River. Sport Fish Division in 1993 expanded this aerial survey escapement goal into an actual escapement abundance goal of 6,300 fish. The guideline sport harvest objective set by the BOF is 300 - 600 chinook salmon.

FISHERY MANAGEMENT ACTIVITIES/RESULTS

The department is currently reviewing the policy on salmon escapement goals, and a new policy may be adopted that will include the chinook salmon escapement goal for the Chena in its application.

BOF ACTIONS

The Board of Fisheries did not take any new actions regulating the Chena River chinook salmon fishery during 1998.

FISHERY OUTLOOK

Proportion of the run that is harvested has been impacted by Emergency Orders restricting or liberalizing harvest during four years of the period 1990 - 1998 and the catch and harvest estimates for 1995 and 1996 are uncorrected. The remaining data points are insufficient to establish trend indices, but harvest has ranged from 64 fish in 1990 to 1,037 fish in 1997. Angler interest and effectiveness in the Chena River chinook salmon fishery seems to be increasing and is likely to continue increasing, raising the profile of the fishery as a component of the total allocation of chinook salmon for harvest in the Tanana drainage and in the Yukon River downriver from the confluence of the Yukon and Tanana rivers.

ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES

Chinook salmon escapements (abundance) have been estimated annually by counting salmon using the Chena River dam as a counting tower and by mark-recapture estimates, or both, since 1986 (Table 7). In addition to estimating escapements with tower counts, carcass sampling has been done annually to estimate size and age distributions and sex ratios. Catch and harvest continue to be estimated by RTS.

SECTION IV: SALCHA RIVER CHINOOK SALMON FISHERY

BACKGROUND AND HISTORICAL PERSPECTIVE

The Salcha River flows from headwaters in the Tanana hills about 120 miles northeast of its mouth to enter the Tanana River near Harding Lake. It is a rapid-runoff stream, and the water is transparent or slightly stained with tannin except during periods of heavy runoff. The Richardson Highway bridge crosses the Salcha about three river miles upstream from its confluence with the Tanana, and there is a campground and boat launch at the bridge. There are many cabins along the lower 70 miles of river. Access to the river is limited to boat and aircraft upstream from the bridge, and snowmachine in the winter.

The Salcha River supports populations of: Arctic grayling *Thymallus arcticus*, chinook salmon *Oncorhynchus tshawytscha*, chum salmon *O. keta*, round whitefish *Prosopium cylindraceum*, humpback whitefish *Coregonus pidschian*, northern pike *Esox lucius*, burbot *Lota lota*, longnose suckers *Catostomus catostomus*, slimy sculpins *Cottus cognatus*, and Arctic lamprey *Lampetra japonica*. Grayling, the salmon, the whitefish, pike, and burbot are taken in the sport fishery.

There has been a chinook salmon sport fishery at the Salcha River since before statehood. The salmon fishery is accessible from the Richardson Highway at the bridge and nearby campground and down a trail near the Munson Slough parking area. Boaters launch at the campground and travel downstream to fish at the confluence of the Tanana and Salcha rivers.

The salmon fishery on the Salcha River is closed above a marker located about 2 1/2 miles upriver from the Richardson Highway bridge (about 5 miles upstream from the confluence of the Salcha and Tanana rivers). Most of the spawning occurs upstream of this area.

Harvests exceeded those of the Chena until 1989, and the Salcha River fishery had the higher profile of the Tanana River drainage chinook salmon fisheries. Estimated harvests between 1977 and 1992 ranged from 47 to 904 (Table 7). Catch and harvest did not increase as dramatically in the Salcha as in the Chena, but harvests exceeded 1,000 fish in 1995 and 1996. The 5-year average catch (1993-1997) was 2,477 and average harvest was 923 fish. The harvest potential of this fishery could be increasing due to improvements in the gear and fishing techniques used to target chinook salmon.

Chinook salmon escapement to the Salcha River was estimated by aerial survey by Commercial Fisheries Division from 1974 to 1998, and by either mark-recapture experiments or counting tower operations or both, by Sport Fish Division since 1987. The fishery in the Salcha was closed by emergency order in 1987 and 1992. Because of large returns, the bag limit was increased to two fish by emergency order in 1993 and 1994.

Estimated chinook salmon escapement abundance (as opposed to aerial survey counts) between 1987 and 1997 ranged from about 3,300 to over 18,400 for the Salcha River (Table 7). The 5-year average (1993 - 1997) is 13,627 fish.

RECENT FISHERY PERFORMANCE (1998 SUMMARY)

Estimates of escapement and length, age, and sex composition of chinook salmon were conducted on the Salcha River during July and August of 1998. Poor run strength indicators for chinook for the entire Yukon River drainage and poor escapement estimates for the Salcha River through July 14th precipitated an emergency order restricting fishing for chinook salmon to catch-and-release only on that date. Estimated catch for 1998 was 600 and harvest was 121 fish.

The final escapement estimate for the 1998 Salcha River chinook run was below the escapement goal set in the current management plans for these fisheries. The estimated escapement was 5,027 (SE = 331), about 29% below the escapement goal of 7,100 fish (Stubby 1998) and 37% of the 5-year average.

FISHERY MANAGEMENT OBJECTIVES

The Salcha River chinook salmon sport fishery is managed under a management plan with an escapement goal and a guideline harvest allocation for the sport fisheries. An escapement goal based on aerial surveys was set by Commercial Fisheries Division in 1992 at 2,500 fish for the Salcha River. Sport Fish Division in 1993 expanded this aerial survey escapement goal into an actual escapement goal of 7,100 fish. The guideline sport harvest objective set by the BOF is 300 - 700 chinook salmon.

FISHERY MANAGEMENT ACTIVITIES/RESULTS

The department is currently reviewing the policy on salmon escapement goals, and a new policy may be adopted that will include the chinook salmon escapement goal for the Salcha River in its application.

BOF ACTIONS

The Board of Fisheries did not take any new actions regulating the Salcha River chinook salmon fishery during 1998.

FISHERY OUTLOOK

No obvious trends are apparent in the Salcha River chinook salmon fishery. Proportion of escapement that is harvested has been impacted by emergency orders restricting or liberalizing harvest during four years of the period 1990 - 1998 and the catch and harvest estimates for 1995 and 1996 are uncorrected. The remaining data points are insufficient to establish trend indices, but harvests have ranged from 291 to 715 fish, which is within the harvest range of the previous ten years (1980 - 1989).

ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES

Chinook salmon escapements (abundance) have been estimated annually by counting salmon using the Salcha River bridge as a counting tower and by mark-recapture estimates, or both, since 1987 (Table 7). In addition to estimating escapements with tower counts, carcass sampling has been done annually to estimate size and age distributions and sex ratios. Catch and harvest continue to be estimated by RTS.

SECTION V: OTHER ANADROMOUS SALMON SPORT FISHERIES AND COMMERCIAL, PERSONAL USE, AND SUBSISTENCE HARVESTS OF TANANA RIVER STOCKS

BACKGROUND AND HISTORICAL PERSPECTIVE

SPORT FISHERIES

A sport fishery for chinook salmon occurs on the Chatanika River downstream from the Elliot Highway bridge. The run is small and attracts little effort. Timing is similar to that of the Salcha and Chena rivers chinook salmon fisheries, with the fishery occurring in July. The 5-year (1993 - 1997) provisional average catch is 525 and harvest is 240 fish (Table 7).

Table 8.-Sport harvest and catch for LTMA coho stocks (Provisional).

Year	Nenana River Drainage		Other Streams		Total	
	Catch	Harvest	Catch	Harvest	Catch	Harvest
1983	N/A ^a	N/A	N/A	0	N/A	84
1984	N/A	N/A	N/A	33	N/A	158
1985	N/A	N/A	N/A	25	N/A	25
1986	N/A	N/A	N/A	460	N/A	281
1987	N/A	0	N/A	0	N/A	0
1988	N/A	255	N/A	206	N/A	461
1989	N/A	192	N/A	288	N/A	493
1990	664	261	24	8	688	269
1991	1,679	222	221	221	1,900	443
1992	583	89	177	109	760	198
1993	0	0	291	29	272	29
1994	720	440	226	99	946	539
1995	114	77	1,016	516	1,130	593
1996	775	149	1,186	199	1,961	348
1997	834	179	447	155	1281	334
1998	542	119	105	6	647	125
Averages						
1990-97	671	177	449	167	1,120	344
1993-97	489	169	633	200	1,122	369

^a NA = data not available.

Minor sport fisheries for summer chum salmon and coho salmon occur in the LTMA (Tables 4 and 8). Chum salmon are primarily available during and just after the chinook salmon fisheries, and are targeted as a secondary species. While chums are generally more abundant than chinook salmon, they are subject to a more liberal daily bag and possession limit (3 fish, or 2 fish if an angler already has a chinook), and are readily taken on certain types of spinning gear; the harvest rate is lower than that for chinook (Table 4.) The poor quality of chum salmon flesh for human consumption is likely a contributing factor. The 5-year (1993 - 1997) provisional average chum salmon harvest in the LTMA was 791 fish.

Coho salmon become available in the Tanana River drainage fisheries during September. They spawn in groundwater-fed stream systems (commonly known as "clearwaters"). There is a major coho salmon fishery in the Upper Tanana River Management Area (UTMA) within the Delta

Clearwater River. Annual area management reports for the UTMA describe run status and escapement to the Delta Clearwater. In the LTMA coho salmon are harvested in tributaries of the Nenana River system near the community of Anderson, and in a few "other streams". These are small-scale fisheries (Table 8). The 5-year (1993 - 1997) provisional average coho salmon harvest in the LTMA was 369 fish.

1998 SUMMARY

As in the Salcha and Chena rivers, the Chatanika River chinook salmon fishery was restricted to catch and release on July 14, 1998, in response to a very poor Yukon River chinook salmon return. Estimated catch was 39 fish and harvest was 6 fish (Table 7).

Due to the collapse of the chum salmon runs in the Yukon and Tanana rivers, chum salmon sport fishing in the Yukon River drainage was closed from August 15 to October 1, 1998. The chum harvest in the LTMA during 1998 was 64 fish (Table 4.), compared to the provisional 5-year average (1993 -1997) of 791 fish.

Coho catch in 1998 was 647, about 58% of the 1993 - 1997 5-year average catch of 1,122. Harvest was 125, or about 34% of the 5-year average of 369.

FISHERY MANAGEMENT OBJECTIVES

Management objectives for the Chatanika River chinook salmon fishery and LTMA coho and chum salmon fisheries are to maintain currently available fishing opportunities whenever run strength indicators such as the Commercial Fish Division test fisheries downstream from the sport fisheries and counting tower projects indicate adequate run strength.

FISHERY MANAGEMENT ACTIVITIES/RESULTS

The emergency order closing chum salmon fishing described in the 1998 summary prevented further sport catch and harvest of these fish.

BOF ACTIONS

The Board of Fisheries did not take any new actions regulating the LTMA chum or coho salmon fisheries during 1998.

FISHERY OUTLOOK

Low levels of catch and harvest will continue whenever fishing is not closed by emergency order.

ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES

Chum salmon are counted incidentally to chinook salmon as they pass the counting tower projects at the Salcha, Chatanika, and Chena rivers. These counts can provide run strength information to be combined with information collected by others as the chums approach their final destinations.

COMMERCIAL, SUBSISTENCE, AND PERSONAL USE FISHERIES

The spawning stocks of chinook salmon within the LTMA are the most abundant Yukon drainage chinook spawning stocks between the Anvik River and the Canadian Border, and are very important to commercial, subsistence, and personal use fishermen in the middle Yukon and Tanana rivers.

Tanana River stocks of chinook, chum, and coho salmon provide commercial fisheries in the Tanana River District. Commercial fishing is regulated by emergency order in three statistical areas (6a, 6b, 6c), from the mouth of the Tanana River to the mouth of the Chena River. Commercial fishing above the mouth of the Chena River is prohibited. Commercial harvests target summer chum and chinook salmon, with some incidental catch of coho salmon. From 1995 to 1997, 4.6%, 6.9% and 11.1% of the total Alaskan Yukon River commercial summer chum salmon harvest were caught in Tanana drainage (Table 9). About 2% of the Alaskan Yukon River chinook commercial harvest occurs in the Tanana River drainage, all in the LTMA. For all salmon species, commercial harvest in the Tanana drainage was 9.5% of the total Alaskan Yukon harvest in 1995, 7.7% in 1996, and 6.4% in 1997 (Table 9). The fall chum salmon harvest in the Tanana River drainage constitutes a higher proportion of the total Alaskan Yukon harvest than the summer chum harvest (Table 9), since lower river fisheries close early enough to allow more escapements. In 1997, the Yukon River drainage fall chum salmon Management Plan was implemented directing that commercial fisheries only be allowed when run strengths are projected to be greater than 600,000 fall chum salmon. Based on in-season indicators, the Tanana River component of the fall chum salmon return was weaker than anticipated and was closed to commercial fishing in 1997 (Bergstrom 1997). In 1998, similar weak returns of chum salmon caused the chum salmon commercial fishery to be closed in the LTMA. As a consequence there was no commercial coho salmon fishery in the LTMA in 1997 and 1998.

SUBSISTENCE AND PERSONAL USE HARVESTS

Subsistence and Personal use salmon fisheries occur in the Tanana River within the LTMA. The Tanana River from its confluence with the Yukon to the Wood River is open to subsistence salmon fishing with a permit requirement and periods and other restrictions set by the BOF and the potential for additional regulation by emergency order. Personal-use fishing for salmon is allowed in the Tanana between the Wood River and the Salcha River, and is regulated similar to subsistence fishing.

The Division of Commercial Fisheries Management and Development (CFMD) is charged with management of the subsistence and personal-use fishing in the LTMA, and documentation of the harvest.

In 1995, 1996, and 1997, subsistence and personal-use caught salmon in the Tanana drainage accounted for declining proportions of 25.5%, 18.6% and 13.4% of the total Yukon River subsistence and personal-use harvests (Table 10). Numbers caught also declined from about 84,000 in 1995 to 39,000 in 1997. The decline continued in 1998, with the harvest of 30,000 salmon representing 13.3% of the Yukon drainage total subsistence and personal use harvest.

SECTION VI: CHENA RIVER ARCTIC GRAYLING FISHERY

BACKGROUND AND HISTORICAL PERSPECTIVE

The Chena River grayling fishery has been popular since before statehood, and has increased in stature as the Chena Valley has been developed and access has improved. The grayling fishery is almost entirely an open water fishery, occurring from April through October.

The SWHS divides the Chena into the "upper river" and "lower river at river" mile 71, and reports on effort, catch, and harvest of all species for each section. Species distributions and the regulations restricting salmon fishing and the use of bait above the dam at river mile 45

Table 9.-Commercial salmon harvest in the Tanana River drainage and percent of the Yukon River drainage harvest from 1995 to 1998 (Bergstrom et al. 1999).

Species	1995			1996			1997			1998		
	Tanana	Yukon	%	Tanana	Yukon	%	Tanana	Yukon	%	Tanana	Yukon	%
	Total	Total	Tanana	Total	Total	Tanana	Total	Total	Tanana	Total	Total	Tanana
Chinook	2,747	124,052	2.2	447	90,192	0.5	2,728	113,610	2.4	963	43,699	2.2
Summer chum	37,428	818,414	4.6	46,890	682,233	6.9	25,287	228,252	11.1	570	28,798	1.2
Fall chum	74,117	283,057	26.2	17,574	105,630	16.6	0	58,187	0.0	0.0	0.0	0.0
Coho	6,900	47,013	9.5	7,142	55,982	12.8	0	35,320	0.0	0.0	1	0.0
Total	121,192	1,272,536	9.5	72,053	934,037	7.7	28,015	435,369	6.4	1,533	72,497	2.1

Table 10.-Subsistence and personal use salmon harvest in the Tanana River drainage and percent of Yukon River drainage harvest from 1995 to 1998 (Borba and Hammer 1996 - 1999).

Species	1995			1996			1997			1998		
	Tanana	Yukon	%	Tanana	Yukon	%	Tanana	Yukon	%	Tanana	Yukon	%
	Total	Total	Tanana	Total	Total	Tanana	Total	Total	Tanana	Total	Total	Tanana
Chinook	2,178	48,934	4.50	1,392	45,886	3.00	3,025	57,430	5.3	1,919	56,043	3.4
Summer chum	12,441	119,503	10.40	8,391	125,843	6.70	4,215	113,211	3.7	6,004	87,366	6.9
Fall chum	50,031	131,369	38.10	36,832	129,614	28.40	19,834	95,425	20.8	14,370	62,901	22.8
Coho	19,219	28,642	67.10	15,091	30,802	49.00	11,945	24,295	49.2	7,472	18,121	41.2
Total	83,869	328,448	25.50	61,697	332,145	18.60	39,019	290,361	13.4%	29,765	224,431	13.3

(described in Section III) dictates that almost all of the effort in the SWHS-designated upper river is directed toward grayling. The lower river supports a multi-species fishery, including the chinook salmon fishery which appears to be growing. So while the majority of the effort in the Chena River is probably directed toward grayling, effort has not yet been apportioned between species and the multi-species fishery confounds attempts to describe the total effort targeting grayling within the Chena River fisheries.

From 1977 through the mid-1980s, the Arctic grayling fishery on the Chena River was the largest grayling fishery in the state of Alaska. Annual fishing effort for the period 1979 - 1986 (for all species) averaged about 33,000 angler-days (Table 11). A series of restrictive regulation changes in response to conservation concerns from 1987 through 1992 likely reduced overall effort targeting grayling during that period, although poor weather in 1992 also impacted effort. The regulatory regime has been stable (open to grayling fishing but restricted to catch and release all year) since 1993. Provisional estimates of total effort for the Chena River between 1993 and 1997 averaged about 32,000 days fished, which was 31% of all effort in the LTMA. The increase in effort reported in the upper Chena River during this period is almost entirely directed toward Arctic grayling.

It is important to remember that the 1993 - 1997 averages will change when corrected effort estimates for 1996 are available, and that corrected estimates for 1995 will never be available. The original estimate for total effort in 1997 was 37,638 days fished; while the recomputed estimate was 29,031, a reduction of 23%.

As a result of a population decline of Arctic grayling in the upper Chena River beginning in the mid-1980s, harvest decreased 76% from 1984 to 1985, although effort declined only 39% during that same period. Stock assessment projects during 1986 (Clark and Ridder 1987) and 1987 (Clark and Ridder 1988) reported a decline in population abundance of 49% between these two years. As the population declined, more restrictive regulations were implemented. The bag limit was reduced (from 10 per day to five per day), fishing was closed during the spring spawning period, and the use of bait was eliminated in 1987.

Although harvest decreased for two years after the imposition of these restrictions, and abundance estimates increased, both harvest and effort increased substantially in 1989, prompting the lowering of the bag limit from five per day to two per day. This additional restriction was not sufficient to reduce harvest to sustainable levels, and in 1991 the fishery was further restricted to catch-and-release only. The grayling population in the Chena River appeared to be rebuilding during the early 1990s. Abundance (using estimates of abundance of grayling 150 mm FL and larger within the lower 90 miles of the river) rose and peaked in the mid - 1990's, with abundance estimates increasing to 45,000 fish in 1995 (Table 12). Subsequently, estimated abundance declined, decreasing between 1995 and 1997. However, abundance of larger, older fish appears to be (age 5 and older) trending upward (Ridder 1999).

Because harvest was ending at the same time that the SWHS began reporting both catch and harvest, little inference can be made about the proportion of catch that was harvested. Catches of Arctic grayling in the Chena River are trending upward and (provisionally) represented between 35% and 48% of all grayling caught in the LTMA between 1993 and 1997, reaching an all-time high of over 72,000 fish in 1997. Average contribution to total LTMA grayling catch during that period was 39% (Table 11).

Table 11.-Estimated angler effort (number of angler-days) and Arctic grayling harvest and catch from the Chena River, 1977-1998 (Provisional).

Year	Upper Chena Effort ^a	Lower Chena Effort ^a	Total Effort ^a	Effort as % of LTMA Effort	Grayling Harvest	Harvest as % of LTMA Grayling Harvest	Grayling Catch	Grayling Catch as % of LTMA Grayling Catch
1977	N/A ^g	NA	30,002	N/A	21,723	N/A	N/A	N/A
1978	N/A	NA	38,341	N/A	33,330	N/A	N/A	N/A
1979	8,016	14,122	22,138	N/A	27,977	N/A	N/A	N/A
1980	10,734	19,920	30,654	N/A	41,825	N/A	N/A	N/A
1981	10,740	16,013	26,753	N/A	27,548	N/A	N/A	N/A
1982	15,166	25,369	40,535	N/A	29,318	N/A	N/A	N/A
1983	16,725	24,177	40,902	40%	21,866	36%	N/A	N/A
1984	11,741	28,482	40,223	39%	30,400	49%	N/A	N/A
1985	8,568	18,565	27,133	30%	8,038	21%	N/A	N/A
1986	10,688	24,342	35,030	34%	9,209	30%	N/A	N/A
1987 ^b	10,667	14,398	25,065	24%	3,090	12%	N/A	N/A
1988 ^{b, c}	9,677	22,174	31,851	25%	5,328	15%	N/A	N/A
1989 ^{b, c}	10,014	27,548	37,562	27%	13,737	35%	N/A	N/A
1990 ^{b, c, d}	6,949	22,412	29,361	22%	4,507	25%	35,869	29%
1991 ^{b, c, d, e}	8,591	12,547	21,138	20%	3,719	20%	29,548	30%
1992 ^f	4,983	7,671	12,654	16%	0	0%	20,775	26%
1993 ^f	6,018	15,631	21,649	21%	0	0%	44,406	35%
1994 ^f	7,912	19,280	27,192	27%	114	1%	60,604	35%
1995 ^f	13,319	24,160	35,181	31%	212	1%	39,254	37%
1996 ^f	15,214	29,555	45,942	36%	0	0%	50,083	40%
1997 ^f	11,381	17,650	29,031	30%	0	0%	72,377	48%
1998 ^f	10,826	17,105	27,931	33%	0	0%	88,987	44%
Averages								
1979-86	11,547	21,374	32,924	-	24,523	-	NA	NA
1993-97	10,769	21,255	32,024	31%	-	-	53,345	39%

^a Effort is for combined Chena River fisheries - grayling, burbot, northern pike, salmon, etc.

^b Special regulations were in effect during 1987 through 1991. These regulations were: catch-and-release fishing from 1 April until the first Saturday in June; a 305 mm (12 inch) minimum length limit; and, a restriction of terminal gear to unbaited artificial lures.

^c In addition to the special regulations, a catch-and-release area was created on the upper Chena River (river km 123 to 141).

^d The daily bag and possession limits were reduced from 5 fish to 2 fish in 1990.

^e During 1991, the Chena River and its tributaries were closed to possession of Arctic grayling from 1 July through 31 December.

^f During 1992 - 1998, the Chena River and its tributaries were closed to possession of Arctic grayling.

^g NA = not available.

Table 12.-Estimated abundance^a of Arctic grayling within the assessed section (river mile 5 to river mile 90) of the Chena River, 1987 - 1998.

Year	Estimated Abundance
1987	29,891
1988	22,204
1989	19,028
1990	31,815
1991	26,756
1992	29,649
1993	39,618
1994	44,375
1995	45,114
1996	41,463
1997	35,837
1998	27,565

^a Abundance is for fish age-150 mm FL and longer.

^b Data from Ridder (1998) and B. Ridder, Dept. of Fish and Game, Delta, personal communication.

1998 SUMMARY

Abundance estimation was conducted for Arctic grayling in the lower 150 km of the Chena River during 1998 (Ridder 1999). The estimate for 1998 was 27,565 fish over 150 mm in length, which represents a 23% decrease from the estimate of 1997, and a 30% decrease from the estimate of 1996. Age and size composition of Arctic grayling sampled during 1998 indicated that there was little decrease in the number of fish age-5 and older, but that the number of fish younger than 5 years old had dropped substantially from the 1997 estimate.

Effort declined slightly in 1998 to 27,931 days fished but the provisional estimate of catch climbed to 89,000.

FISHERY MANAGEMENT OBJECTIVES

There is currently no Management Plan in place for Arctic grayling in the Chena River. There was a Chena River Arctic Grayling Conservation and Rehabilitation Plan adopted in 1992. That plan is no longer in effect. The rehabilitation enhancement efforts outlined in the plan proved to be unsuccessful, and are no longer being undertaken. In the absence of a management plan, the objectives for the Chena River Arctic grayling fishery are to not allow a consumptive fishery until the population of Arctic grayling in the assessed section of the river exceeds 40,000 fish, 230 mm or larger, for two years consecutively, while allowing the opportunity for catch-and-release angling.

FISHERY MANAGEMENT ACTIVITIES/RESULTS

As well as eliminating sport harvest through regulation changes, the department initiated a program of stock enhancement, stocking hatchery and pond-reared Arctic grayling, spawned from Chena River stock. Approximately 61,000 fish (each year) were stocked in the 100 river miles of the Chena River during 1993 and 1994. Survival of these fish was estimated as part of ongoing stock assessment efforts during 1993, 1994, and 1995. Survival of introduced fish was determined to be too low to justify the cost of the enhancement effort and stocking was not continued after 1994 (Clark 1994, 1995 and 1996). Other management activities related to this fishery in the last several years have involved public education regarding the stock status and the current regulations. Regulatory signs have been posted at angler-access sites along the river, and information on catch-and-release techniques has been provided at campgrounds in the Chena River State Recreation Area.

BOF ACTIONS

There were no proposals submitted to the Board of Fisheries related to Chena River Arctic grayling during the 1995-97 board cycle, and no board action was taken relating to this fishery.

FISHERY OUTLOOK

The grayling fishery on the Chena River remains catch-and-release only. Overall abundance is not increasing. Effort is trending upward, and catch is increasing. The catch-and-release fishery is prompting some concern over the amount of hooking mortality the stock can sustain. There has been little pressure from user groups to re-open the river to consumptive harvest.

ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES

Division of Sport Fish has conducted research on the stock status of Arctic grayling in the Chena River every year since 1971. Early research produced abundance estimates in index sections of the river, but research since the late 1980s has involved estimating the abundance for the lower

90 miles of river. In addition to conducting ongoing stock assessment of Arctic grayling in the Chena River, a radio-telemetry project was initiated to investigate the contribution of fish upstream of the assessment area to the overall spawning stock.

Some stock assessment of Arctic grayling in the Chena River will continue for the near future. Effort and catch will be monitored through the SWHS. A Management Planning process will begin.

SECTION VII: PILEDRIVER SLOUGH ARCTIC GRAYLING FISHERY

BACKGROUND AND HISTORICAL PERSPECTIVE

Piledriver Slough is a clearwater stream that flows for some 21 miles parallel to and between the Richardson Highway and the Tanana River adjacent to Eielson Air Force Base. It was originally a slough of the (glacial) Tanana River and headwaters of Chena Slough, which flowed from the mainstem of the Tanana River north and west through Fairbanks. A dike was built at Moose Creek in the 1940s, cutting Chena Slough off from the Tanana River and creating Badger Slough and the lower Chena River as the non-glacial systems that exist today. The Chena River became a rapid-runoff stream along its entire length and Badger Slough is characterized as a "groundwater" or "spring-fed" system supplied by the aquifers of the Tanana and Chena rivers. Piledriver Slough remained as a turbid side slough of the Tanana River. During the early stages of the construction of the Chena Lakes Flood Control Project by the Army Corps of Engineers (COE) in 1975, dikes were constructed cutting off the headwaters of Piledriver Slough from the Tanana River. The lower section of Piledriver Slough below Moose Creek was routed through a series of slough channels and man-made channels to avoid the floodway and associated dikes. Piledriver Slough then became a system fed by upwellings analogous to Badger Slough, with silty water from the Tanana River flowing only when the Tanana is extremely high or there are ice jams, causing flooding in the area of the headwater dikes. Moose Creek is a tannic-stained tributary to Piledriver Slough, entering it about three river miles upstream from its confluence with the Tanana. Because the dikes were built for the purpose of protecting the main flood control project from Tanana River flooding until construction of the main flood control project was completed, the COE has in the past taken the position that they are no longer needed and will not be maintained. This issue arose when the Tanana River was cutting a channel that had the potential to break into Piledriver Slough in the area of the dikes and return the slough to its original, glacial condition.

The slough is road accessible at several points, and there are rural neighborhoods along the upper reaches. The middle section flows through part of the Eielson Air Force Base reservation, and an easily obtained permit is required by the military for access. It can be traversed with a canoe or light inflatable boat, but powerboats can be used only on the lower 3 miles. The clarity of the water creates the best possible visibility conditions for anglers looking for fish, and the stream can be crossed on foot readily in most reaches.

When Piledriver Slough became a clear stream, fish species common to clear streams within the LTMA colonized it. They were likely present when glacial water flowed through, but most probably utilized it primarily as an overwintering area and migratory corridor. Piledriver Slough seasonally supports populations of or is visited by: Arctic grayling *Thymallus arcticus*, round whitefish *Prosopium cylindraceum*, humpback whitefish *Coregonus pidschian*, least cisco *C.*

sardinella, northern pike *Esox lucius*, burbot *Lota lota*, longnose suckers *Catostomus catostomus*, slimy sculpins *Cottus cognatus*, lake chubs *Couesius plumbeus*, Arctic lamprey *Lampetra japonica*, and a few sheefish *Stenodus leucichthys*. A few chum salmon *O. keta* spawn there, and the slough is stocked annually with (sterile all-female triploid) rainbow trout. Grayling, rainbow trout, whitefish, pike, burbot, and sheefish are taken in the sport fishery.

The grayling that became established as a spawning stock after the dikes were built at the upper end were likely Moose Creek fish. A relatively large Arctic grayling fishery has developed at Piledriver Slough since the late 1970s (Table 13). Anglers have been attracted to the fishery by the easy availability of grayling and the only stream fishery for rainbow trout north of the Alaska Range. The small numbers of large predators (pike, burbot, and sheefish) and whitefish are present in the lower 3 miles (from Moose Creek downstream). While they add diversity to the fishery, the primary focus of anglers is the grayling/rainbow trout fishery. Both species inhabit the same waters and are taken with the same gear, so effort cannot be segregated. Effort at Piledriver Slough increased dramatically from the mid-1980s to 1990, and then began a declining trend that continues (Table 14). Grayling stock declines and regulatory restrictions may be partially responsible for the decline, but examination of Tables 13 and 14 indicate that catch rate (based on provisional information) is steady or improving.

Because concerns about the vulnerability of the grayling to increasing fishing effort, in 1987 a 12 inch minimum size limit was implemented and the use of bait on small hooks eliminated at Piledriver Slough below its confluence with Moose Creek. Grayling fishing in the same area of Piledriver Slough was restricted to catch-and-release only in 1993.

The grayling population at Piledriver Slough fell dramatically between 1992 and 1997, with estimated abundance falling almost in half from about 14,000 to about 8,700 (Fleming 1997, 1998). However, density (fish per km) was 627, higher than the 1990 density of 530 and near the 7-year average of 620. Between 1991 and 1996, the amount of habitat available to Arctic grayling for spawning and rearing at Piledriver Slough has fallen by a little over half, due to the construction of several large beaver dams blocking fish passage. As long stretches of Piledriver Slough became devoid of fish, angling opportunity was also reduced. This habitat loss has been accompanied by a corresponding reduction in the estimated grayling population.

1998 SUMMARY

Effort declined slightly in 1998, and is less than half of the provisional five-year average (Table 14), but grayling catch increased and exceeds the provisional five-year average (Table 13). With catch at 24,000 and the most recent estimated abundance at around 9,000, many fish are being caught repeatedly. At a (very liberal) hooking mortality rate of 5% for released fish, 1,200 of the released grayling would have died. This represents a 13% hooking mortality rate.

FISHERY MANAGEMENT OBJECTIVES

The management objective in Piledriver Slough pertaining to grayling is to ensure that the fishing mortality on the Arctic grayling population does not exceed 20% annually.

FISHERY MANAGEMENT ACTIVITIES/RESULTS

Grayling fishing in Piledriver Slough was restricted to catch-and-release only in 1993. Harvest of grayling has ended.

Table 13.-Estimated sport catch and harvest of Arctic grayling in Piledriver Slough and in all LTMA fisheries, 1983-1998 (Provisional).

Year	Piledriver Slough		LTMA Total	
	Catch	Harvest	Catch	Harvest
1983	N/A	5,822	N/A	60,748
1984	N/A	3,751	N/A	61,560
1985	N/A	N/A	N/A	37,611
1986	N/A	N/A	N/A	30,398
1987	N/A	4,907	N/A	24,723
1988	N/A	8,095	N/A	36,489
1989	N/A	4,459	N/A	39,407
1990	38,480	2,380	122,342	17,732
1991	20,815	3,987	98,562	18,503
1992	15,252	1,030	78,820	8,275
1993	32,036	759	127,383	11,377
1994	31,324	57	171,968	11,826
1995	17,431	0	105,251	16,291
1996	16,667	0	123,971	5,073
1997	19,092	0	151,154	8,520
1998	24,336	0	203,573	6,160
Averages				
1983-97	N/A	N/A	N/A	25,902
1990-97	23,887	N/A	122,431	12,200
1993-97	23,310	N/A	135,945	10,617

NA = not available.

Table 14.-Estimated (Provisional) angling effort (number of angler-days) from Piledriver Slough, 1983-1997.

Year	Piledriver Slough
1983	4,148
1984	4,651
1985	N/A
1986	N/A
1987	13,257
1988	24,375
1989	22,746
1990	27,705
1991	17,703
1992	13,607
1993	17,253
1994	11,369
1995	12,613
1996	11,736
1997	6,834
1998	5,126
Averages	
1983-97	14,461
1993-97	11,961

The department has initiated a study to investigate the effect on Arctic grayling abundance and distribution of increasing the amount of habitat available to Arctic grayling in Piledriver Slough. The study will allow fish passage to areas of the slough not currently available to fish by removing several of the lower beaver dams, and will determine if grayling in Piledriver Slough begin to utilize the habitat that is no longer blocked to fish passage. In October of 1998, trappers were permitted to begin before the regular season to remove beavers in the farthest downstream sections of Piledriver in which fish passage was blocked by beaverdams. Immediately after freezeup, the dams were breached down to the riverbed, and the ponds behind them drained.

BOF ACTIONS

The BOF adopted a department proposal during the 1997 meeting to change the current codified regulation for Arctic grayling at Piledriver Slough to catch-and-release only. This change did not result in an actual change in regulations, since the regulation proposed by the department and adopted by the Board had already been in effect by emergency order since 1993.

FISHERY OUTLOOK

If grayling re-colonize the areas made available to them by beaverdam removal, density should decline as grayling spread out into the formerly barren areas. The catch rate might follow suit, particularly since the areas being re-opened to grayling are less accessible. Subsequently abundance might increase as grayling take advantage of more available spawning areas.

ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES

Evaluation of grayling distribution above removed beaverdams will continue. Stock assessment should be undertaken after the dam removal project has evolved into a maintenance phase and grayling distribution appears stable. Catch, harvest, and effort will be monitored through the SWHS. Stock status should be monitored on a regular basis to measure changes in the population. A management plan should be developed that sets thresholds for regulatory action if stocks should decline, and reinstates opportunity when stocks recover.

SECTION VIII: SALCHA RIVER ARCTIC GRAYLING FISHERY

BACKGROUND AND HISTORICAL PERSPECTIVE

The Salcha River Arctic grayling fishery has supported increasing catch and fairly consistent harvest over recent years and provides a substantial proportion of the harvest opportunity for grayling in the LTMA (Table 15). The majority of the grayling fishing opportunity is accessible only by boat, and a high proportion of the effort is from people who have property along the river and their visitors. The harvest was higher prior to the imposition of a 12-inch minimum size limit, restrictions on the use of bait, and the restriction to catch and release during the spring spawning period regulations that were imposed in 1989. The restrictions, likely coupled with an attitude among anglers who fish there often that they need not harvest all of the fish they are legally entitled to in order to "get what they want", are probably causing the harvest rate (of fish over 12 inches in length that may be legally harvested) to remain steady. For example, in 1997 the catch of grayling over 12 inches in length was 7,415, and harvest was 2,959 (Howe et al. 1998). Overall, catch appears to be trending upward (Table 15).

Table 15.-Estimated sport catch and harvest of Arctic grayling in the Salcha River and in all LTMA fisheries, 1977-1998 (Provisional).

Year	Salcha River		LTMA Total	
	Catch	Harvest	Catch	Harvest
1977	N/A	6,387	N/A	N/A
1978	N/A	9,067	N/A	N/A
1979	N/A	5,980	N/A	N/A
1980	N/A	5,351	N/A	N/A
1981	N/A	3,983	N/A	N/A
1982	N/A	6,843	N/A	N/A
1983	N/A	9,640	N/A	60,748
1984	N/A	13,305	N/A	61,560
1985	N/A	5,826	N/A	37,611
1986	N/A	7,540	N/A	30,398
1987	N/A	4,762	N/A	24,723
1988	N/A	2,383	N/A	36,489
1989	N/A	5,721	N/A	39,407
1990	8,609	1,992	122,342	17,732
1991	4,697	1,688	98,562	18,503
1992	8,265	1,592	78,820	8,275
1993	11,254	1,768	127,383	11,377
1994	9,995	2,308	171,968	11,826
1995	12,173	2,685	105,251	16,291
1996	10,327	1,747	123,971	5,073
1997	15,959	2,959	151,154	8,520
1998	19,163	2,179	203,573	6,160
Averages				
1983-97	N/A	4,394	N/A	25,902
1990-97	10,160	2,092	122,431	12,200
1993-97	11,942	2,293	135,945	10,617

NA = not available.

Effort through 1997 is showing no particular trend, particularly considering that the estimates for 1995 and 1996 are incorrect (Table 16.) Effort on this multi-species fishery is impacted by the quality of the chinook salmon fishery from year to year, hydrological conditions that can at one extreme (high water) make grayling fishing very difficult and at the other (low water) limit boat access to fishing areas, and the weather and timing of breakup and freeze up. The low effort in 1992 is likely due in part to very bad weather that summer.

The most recent grayling stock assessment study was completed in 1993. Abundance was increasing (compared to estimates from 1990 - 1992) and indicators of good survival of younger fish were measured (Roach, 1994).

1998 SUMMARY

Catch rose to about 19,000 grayling in 1998, and harvest was stable at about 2,200 grayling (Table 15). Effort declined to about 5,700 days fished (Table 16) due to a combination of a poor run of chinook salmon and the emergency order closing salmon fishing, and very low river stages throughout the summer limiting boat access.

FISHERY MANAGEMENT OBJECTIVES

The management objectives for this fishery include providing for a sustainable grayling fishery and the opportunity to sustain 7,500 days of angler effort per year.

FISHERY MANAGEMENT ACTIVITIES/RESULTS

The present regulatory regime seems to be conserving the grayling stocks and meeting the objectives.

BOF ACTIONS

There has been no BOF activity regarding this fishery recently.

FISHERY OUTLOOK

The grayling population should be able to sustain the current level of harvest unless biological factors such as a series of recruitment failures intercede.

ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES

Catch, harvest, and effort will be monitored through the SWHS. Stock status should be monitored on a regular basis to measure changes in the population. A management plan should be developed that sets thresholds for regulatory action if stocks should decline, and reinstates the present regulatory regime when stocks recover.

SECTION IX: CHATANIKA RIVER ARCTIC GRAYLING FISHERY

BACKGROUND AND HISTORICAL PERSPECTIVE

The Chatanika River, formed by the confluence of Faith, McManus, and Smith creeks about 50 miles northeast of Fairbanks, flows southwest out of the White Mountains for about 170 river miles and ends at its confluence with the Tolovana River in Minto Flats about 50 miles west of Fairbanks. The Chatanika River is a clear or lightly tannic stained rapid-runoff stream, and flows through valleys between summits and uplands for about four-fifths of its length before it enters Minto Flats. At that point the character of the river changes from one typical of rapid-

Table 16.-Estimated (Provisional) angling effort (number of angler-days) from the Salcha River, 1977-1997.

Year	Salcha River
1977	8,167
1978	9,715
1979	14,788
1980	8,858
1981	8,090
1982	14,126
1983	11,802
1984	8,449
1985	13,109
1986	13,792
1987	10,576
1988	7,494
1989	9,704
1990	9,783
1991	11,242
1992	4,833
1993	7,313
1994	7,653
1995	14,516
1996	13,046
1997	8,703
1998	5,789
Averages	
1977-97	10,274
1993-97	9,503

runoff upland streams with pools, riffles, cutbanks and gravel bars and a substrate consisting largely of gravel or broken rock to a slower stream with an incised channel with high, fairly stable banks and a bottom substrate consisting primarily of sand and organic material. Mining activity dominated the upper Chatanika during the first half of the 20th century. A diversion dam one mile below Faith Creek still blocks fish passage, though the dam no longer serves any purpose.

The Chatanika River supports populations of: Arctic grayling *Thymallus arcticus*, chinook salmon *Oncorhynchus tshawytscha*, chum salmon *O. keta*, round whitefish *Prosopium cylindraceum*, humpback whitefish *Coregonus pidschian*, broad whitefish *Coregonus nasus*, least cisco *C. sardinella*, northern pike *Esox lucius*, burbot *Lota lota*, sheefish *Stenodus leucichthys*, longnose suckers *Catostomus catostomus*, slimy sculpins *Cottus cognatus*, lake chubs *Couesius plumbeus*, Alaska blackfish *Dallia pectoralis*, and Arctic lamprey *Lampetra japonicas*. Grayling, chinook and chum salmon, and humpback and round whitefish, and least ciscos are the focus of sport fishing effort upstream of Minto Flats. Pike and burbot are the mainstay of the Chatanika River sport fishery within Minto Flats, and small numbers of sheefish are taken in Minto Flats and in the lower portions of the Chatanika within the uplands.

The Chatanika River is paralleled by the Steese Highway along its upper 50 river miles. The Elliot Highway crosses it about 60 river miles upstream from Minto Flats, and the Murphy Dome Road ends at the Chatanika River about 3 miles upstream from Minto Flats. The river downstream from the Elliot Highway bridge is used by anglers traveling in powerboats. There are boat landings at the Elliot Highway bridge and at the Murphy Dome Road. Boaters also travel from Nenana down the Tanana River or from Manley up the Tanana River to get into Minto Flats and upstream into the Chatanika River. There is a boat launch at Minto Village into the Tolovana River, a short distance from the Chatanika River in Minto Flats. The upper Chatanika River is also a popular float trip. The majority of this is upstream from the Elliot Highway bridge, with some float trips downstream to the Murphy Dome Road and very few into Minto Flats.

The grayling sport fishery has been documented and studied since the 1950s and has probably been in existence in one form or another since the gold rush in the early 1900s. The grayling population undoubtedly went through periods of severe decline while either or both fishing and mining activity were unrestricted. We cannot say to what extent the stock has subsequently recovered, but it supports what is considered to be a healthy grayling population and stock assessments of Arctic grayling have been done periodically in the Chatanika River since the mid-1980s. The current regulatory regime for grayling fishing (a spring spawning period closure and a 12-inch minimum length limit, both throughout the drainage, and no use of bait upstream of the Elliot Highway bridge) was implemented beginning in 1992.

In the upper river, anglers focus almost entirely on grayling, while in the lower river grayling, pike, burbot, sheefish, salmon, and whitefish share the effort. Since 1995, the SWHS has provided effort, catch, and harvest estimates for the "Upper Chatanika" and "Lower Chatanika", with the river divided at the Elliot Highway bridge. However, because of the short duration (4 years) of the split estimates and the problems associated with the calculations during this period, trends cannot be discerned at the writing of this report. Tables 17 and 18 present whole river estimates, as they are reported from 1977 through 1994. Effort (for all species) may be declining slowly, depending on the final estimate for 1996. Catch shows no particular trend and harvest is declining.

Table 17.-Estimated sport catch and harvest of Arctic grayling in the Chatanika River and in all LTMA fisheries, 1977-1998 (Provisional).

Year	Chatanika River		LTMA Total	
	Catch	Harvest	Catch	Harvest
1977	N/A	6,737	N/A	N/A
1978	N/A	9,284	N/A	N/A
1979	N/A	6,121	N/A	N/A
1980	N/A	5,143	N/A	N/A
1981	N/A	3,808	N/A	N/A
1982	N/A	6,445	N/A	N/A
1983	N/A	9,766	N/A	60,748
1984	N/A	4,180	N/A	61,560
1985	N/A	7,404	N/A	37,611
1986	N/A	2,692	N/A	30,398
1987	N/A	5,619	N/A	24,723
1988	N/A	8,640	N/A	36,489
1989	N/A	6,934	N/A	39,407
1990	17,960	4,237	122,342	17,732
1991	12,830	2,642	98,562	18,503
1992	11,750	1,751	78,820	8,275
1993	14,283	2,001	127,383	11,377
1994	24,750	2,659	171,968	11,826
1995	15,859	2,108	105,251	16,291
1996	11,928	383	123,971	5,073
1997	20,133	1,518	151,154	8,520
1998	13,803	882	203,573	6,160
Averages				
1983-97	N/A	4,169	N/A	25,902
1990-97	16,187	2,162	122,432	12,200
1993-97	17,391	1,734	135,945	10,617

NA = not available.

Table 18.-Estimated (Provisional) angling effort (number of angler-days) from the Chatanika River, 1977-1997.

Year	Chatanika River
1977	9,925
1978	10,835
1979	4,853
1980	5,576
1981	4,691
1982	9,417
1983	10,757
1984	8,605
1985	10,231
1986	7,783
1987	11,065
1988	11,642
1989	12,210
1990	11,801
1991	8,085
1992	6,775
1993	7,671
1994	7,272
1995	12,697
1996	11,124
1997	6,944
1998	5,573
Averages	
1977-97	9,046
1993-97	8,547

Stock assessments have been done periodically in the Chatanika River, most recently in 1997. An assessment is that there is no immediate conservation problem for Chatanika River grayling, but that stream productivity is low (Fleming, 1998).

1998 SUMMARY

Effort, catch, and harvest all declined in 1998. This may have been in part due to low water conditions that limited boat access. Catch for 1998 was within the range of the catch for the period when catch has been estimated (1990 - 1997).

FISHERY MANAGEMENT OBJECTIVES

The primary fishery management objective for the Chatanika River is to ensure that harvests and incidental mortality of all species are sustainable and to produce a participation rate of 15,000 angler days per year.

FISHERY MANAGEMENT ACTIVITIES/RESULTS

The present regulatory regime appears to be maintaining a sustainable grayling fishery. Effort is falling short of the goal in the plan. When the plan is reviewed the effort goal will likely be modified or deleted.

BOF ACTIONS

There has been no BOF activity regarding this fishery recently.

FISHERY OUTLOOK

The grayling population should be able to sustain the current level of harvest unless biological factors such as a series of recruitment failures intercede.

ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES

Catch, harvest, and effort will be monitored through the SWHS. Stock status should be monitored on a regular basis to measure changes in the population. A management plan should be developed that sets thresholds for regulatory action if stocks should decline, and restores opportunity when stocks recover.

SECTION X: OTHER WILD STOCK ARCTIC GRAYLING FISHERIES

BACKGROUND AND HISTORICAL PERSPECTIVE

Arctic grayling are popular with recreational anglers, are generally abundant, and occur in many LTMA rivers and streams besides the major fisheries previously detailed (stocked grayling present in lakes are not described in this section). These waters include high gradient Alaska Range streams such as Brushkana Creek along the Denali Highway and other upper Nenana River streams, groundwater/aquifer-fed lowland streams such as Julius Creek in the lower Nenana River drainage, and rapid-runoff streams through a variety of terrain such as Washington Creek and the Little Salcha River. Access ranges from roadside fisheries to those accessible only by traveling by boat along major rivers to the mouth of the tributary containing grayling. As with almost all grayling fisheries in the Tanana River drainage, these fisheries take place during the open-water season. With the exception of Five Mile Clearwater, the grayling fisheries in these streams fall under the background regulation for Arctic grayling in the Tanana River

drainage (5 fish per day and 5 in possession with no size limit) that was instituted in 1975. Much of the reported catch from these fisheries is released rather than harvested (Table 19). With the exception of Brushkana Creek, these fisheries have attracted little research effort. Estimates of angler effort directed toward grayling can be developed if necessary for some of these streams in which the grayling are the focus of the fishery, but collectively effort upon these grayling stocks cannot be estimated due to the mix of species targeted by anglers in these streams. Depending on stream characteristics, all of the stream-resident species targeted by anglers within the Tanana River drainage are present in this aggregation of flowing waters. Estimates of effort, catch, and harvest for these waters are somewhat less reliable than those for the major fisheries because the estimates for the smaller fisheries are often based on a small number of responses to the SWHS questionnaire. Nevertheless, the trend information is useful and may provide a history of a fishery if conservation concerns raise its profile.

Catch and harvest vary considerably, in part because many of these small fisheries enter and drop out of the SWHS report from one year to the next, depending upon whether any of the small number of anglers utilizing them are selected for inclusion in the SWHS. Catch and harvest from these streams is a major component of the total LTMA grayling fishery (Table 19). The trends seem stable within a wide range. Corrected data for 1996 - 1998 will be presented in a future report and will clarify the trend information.

1998 SUMMARY

Estimated catch increased and was the highest reported and about twice the average for the period 1993-1997, but will likely be somewhat lower when the estimates are corrected. Provisional estimated harvest declined in 1998 and was only 18% of the five-year average of 4,593.

FISHERY MANAGEMENT OBJECTIVES

There are no management plans for any of these fisheries. The "default" objective is to conserve the stocks while maintaining angler opportunity at a sustainable level.

FISHERY MANAGEMENT ACTIVITIES/RESULTS

The current regulatory structure appears to be maintaining these fisheries.

BOF ACTIONS

During the 1997 BOF meeting the board amended and adopted a public proposal (supported by the department) to change the grayling bag and possession limit in Five Mile Clearwater Creek from 5 fish per day with no size limit, to 2 fish per day, only one of which could be over 12 inches.

FISHERY OUTLOOK

It is likely that angler pressure will increase on these fisheries.

ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES

Catch, harvest, and to a certain extent effort will be monitored through the SWHS. Stock status assessment work should begin on fisheries for which conservation concerns arise. The Brushkana Creek and Nenana River grayling stocks may become candidates for stock assessment research. A management plan should be developed that maintains opportunity and conserves stocks. If more restrictive regulations are proposed, they should be structured within the existing

Table 19.-Estimated sport catch and harvest of Arctic grayling in other wild stock LTMA stream fisheries, 1977-1998 (Provisional).

Year	Other Wild Stock Stream Fisheries		LTMA Total	
	Catch	Harvest	Catch	Harvest
1983	N/A	13,074	N/A	60,748
1984	N/A	6,574	N/A	61,560
1985	N/A	15,318	N/A	37,611
1986	N/A	10,192	N/A	30,398
1987	N/A	5,115	N/A	24,723
1988	N/A	9,465	N/A	36,489
1989	N/A	5,850	N/A	39,407
1990	18,750	3,527	122,342	17,732
1991	34,237	4,840	98,562	18,503
1992	15,671	2,896	78,820	8,275
1993	15,254	4,251	127,383	11,377
1994	24,070	3,877	171,968	11,826
1995	10,891	9,359	105,251	16,291
1996	21,608	2,311	123,971	5,073
1997	14,206	3,167	151,154	8,520
1998	35,430	868	203,573	6,160
Averages				
1983-97	N/A	6,654	N/A	25,902
1990-97	19,336	4,278	122,431	12,200
1993-97	17,206	4,593	135,945	10,617

^a NA = not available.

framework of regulations within the LTMA so that there is not a proliferation of different regulations.

SECTION XI: TOLOVANA RIVER DRAINAGE/MINTO FLATS/LOWER CHATANIKA RIVER NORTHERN PIKE FISHERY

BACKGROUND AND HISTORICAL PERSPECTIVE

Minto Flats, located about 30 miles west of Fairbanks, is an approximately 500,000-acre area of marsh and lakes interconnected by numerous sloughs and several rivers. Most of the area is included in the Minto Flats Game Refuge, and is one of the most important waterfowl nesting areas in the Tanana River drainage. The Chatanika, Tolovana, and Tatalina rivers and Washington, Goldstream, and numerous smaller creeks flow into Minto Flats, coming together as tributaries to the Tolovana River, itself a tributary to the Tanana River at its mouth at the southwestern end of the Flats. The glacial Tanana River forms the southern boundary of Minto Flats, and two major sloughs of the Tanana (Swanneck Slough and Grassy Slough) cut into the flats and flow into the lower Tolovana River. Except for the Tanana River, the waterways of the flats are slow and meandering. The lakes of Minto Flats are generally shallow and heavily vegetated. A group of interconnected lakes in the eastern flats, connected to Goldstream Creek, are called the Minto Lakes. The Minto Lakes are a major northern pike spawning and summer feeding area within Minto Flats. Big Minto Lake and Upper Minto Lake are the largest of these lakes. The surface area of the standing waters of Minto Flats varies drastically from summer to summer and sometimes within each summer, depending on the volume of tributary streams and the stage of the Tanana River. Summer habitat for northern pike in Minto Flats covers about 27,000 acres. In winter much of the flowing and standing water within the flats becomes anoxic, forcing fish to move to waters of the Tanana River or up tributary rivers to oxygenated areas. Winterkill is common, and can be a confounding factor in attempts to predict fish population dynamics and assess angler impact.

Fish species present in the lakes and waterways as residents for either part of the year or as migrants include northern pike *Esox lucius*, burbot *Lota lota*, sheefish *Stenodus leucichthys*, humpback whitefish *Coregonus pidschian*, broad whitefish *Coregonus nasus*, least cisco *C. sardinella*, Arctic grayling *Thymallus arcticus*, chinook salmon *Oncorhynchus tshawytscha*, chum salmon *O. keta*, round whitefish *Prosopium cylindraceum*, longnose suckers *Catostomus catostomus*, slimy sculpins *Cottus cognatus*, lake chubs *Couesius plumbeus*, Alaska blackfish *Dallia pectoralis*, and Arctic lamprey *Lampetra japonica*. The salmon are migrants through Minto Flats and the lower Chatanika River, traveling to and from spawning grounds in the middle and upper Chatanika River. The grayling and round whitefish are primarily residents of the rivers and streams beyond the periphery of Minto Flats, but some likely travel through Minto Flats to and from overwintering areas in the Tanana River. The northern pike fishery of the lower Chatanika River (described in the SWHS reports as downstream from the Elliot Highway bridge) is included in this section because the Minto Lakes and Chatanika River northern pike stocks are commingled, the fisheries overlap, and the lower 35 miles of the Chatanika River is within Minto Flats. It is impractical to treat them separately. General references to Minto Lakes pike within this section, then, include the Chatanika River within the flats, downstream from the Murphy Dome Road. Similarly, because effort, catch, and harvest estimates for the Tolovana River appear occasionally in the SWHS data, and Minto Flats and all of its waters are within the

Tolovana River drainage and are regulated as such, Table 20 contains all inclusive columns of catch and harvest for the Tolovana River drainage (Tolovana River, Minto Flats, and the lower Chatanika River). Where necessary, differentiation and clarification between the groups of waters will be made in the text.

The fisheries at Minto Flats and on the Chatanika River are accessed primarily by boat and float plane. Anglers travel from the Murphy Dome Road down the Chatanika River to Goldstream Creek, then up Goldstream Creek to the Minto Lakes. There is also a boat launch into the Tolovana River at Minto Village, located along the western margin of Minto Flats and accessible from the Elliot Highway. Boaters also travel from Nenana down the Tanana River or from Manley up the Tanana River to enter Minto Flats via the Tolovana River. People from Minto Village travel throughout the flats year-round to fish, hunt, and trap.

The Minto Lakes are a popular pike fishing and waterfowl hunting area, and in addition to boat users, there are both guiding services and private pilots that travel to the lakes in floatplanes. Guides and private individuals have cabins on some of the sparse areas of higher ground that are not regularly flooded. The Minto Lakes support the majority of the sport fishery for northern pike within the Tolovana River Drainage.

The Tolovana Drainage/Minto Flats sport fishery has supported a major proportion of the LTMA northern pike sport fishery for many years (Table 20). It was primarily a summer fishery until the mid-1980s, when an intensive sport fishery developed on concentrations of northern pike that were overwintering in the Chatanika River just upstream from the mouth of Goldstream Creek. Total harvest for the Tolovana River drainage doubled from 1984 to 1986. Many of the fish harvested were large females. It was felt (and later demonstrated by radiotelemetry studies, most recently by Roach, 1998) that these fish were the spawning stock for the Minto Lakes. After 1987, regulations were implemented closing sport fishing for northern pike at Minto Flats between October 15th and May 31, and the bag limit was reduced from ten per day to five per day, and only one over 30 inches in length could be retained as part of the bag limit. Estimated catch and harvest (and catch rate) peaked in 1994 with a catch in Minto Flats of 47,248 and a harvest of 8,438. Provisional estimates of catch and harvest have declined since. However, provisional estimates of effort in Minto Flats have also declined, so that catch rate has not declined excessively (Table 21). Although effort is not estimated by target species (fishery), it is felt that the majority of the effort at Minto Flats is directed toward northern pike and that estimates of catch, harvest, and effort for Minto Flats are an acceptable trend index for the pike fishery. Unfortunately, the multi-species nature of the Lower Chatanika River fishery makes it difficult to determine effort directed toward pike. However, estimates of catch and harvest within the Lower Chatanika are germane to considerations of Minto Flats northern pike stock status.

A subsistence fishery for northern pike (and whitefish) occurs near Minto Village and at historically used sites in the eastern portions of Minto Flats (Andrews, 1988). Gill nets are used throughout the open-water period and pike are taken through the ice with hook and line. Based on the records of ADF&G Commercial Fish Division, subsistence harvest has ranged from about 800 to 1,500 northern pike during the period 1993 - 1997.

Table 20.-Sport catch and harvest^a of northern pike in the Tolovana - Minto Flats complex and the LTMA, 1983-1998 (Provisional).

Year	Tolovana River		Lower Chatanika River		Minto Flats		Tolovana River Drainage		LTMA Total	
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest
1983	N/A	N/A	N/A	713	N/A	2,748	N/A	3,461	N/A	7,898
1984	N/A	286	N/A	389	N/A	2,453	N/A	3,128	N/A	6,357
1985	N/A	347	N/A	763	N/A	4,146	N/A	5,256	N/A	8,224
1986	N/A	279	N/A	1,282	N/A	4,927	N/A	6,488	N/A	8,112
1987	N/A	66	N/A	554	N/A	1,781	N/A	2,401	N/A	6,105
1988	N/A	109	N/A	364	N/A	1,492	N/A	1,965	N/A	7,599
1989	N/A	50	N/A	812	N/A	1,734	N/A	2,596	N/A	8,310
1990	135	51	979	388	4,946	1,570	6,060	2,009	23,964	5,414
1991	164	30	520	401	5,427	2,155	6,111	2,586	23,037	9,426
1992	0	0	410	26	6,175	1,299	6,585	1,325	24,477	4,200
1993	0	0	4,842	1,344	19,536	2,076	24,378	3,420	41,809	7,743
1994	0	0	4,943	1,051	47,248	8,438	52,191	9,489	76,372	13,200
1995	1215	0	6,155	1,354	21,823	3,126	29,193	4,480	43,578	10,581
1996	646	9	3,338	629	12,495	2,078	16,479	2,716	34,867	4,890
1997	0	0	2,594	244	14,714	1,072	17,308	1,316	28,290	3,181
1998	0	0	846	47	6,964	732	7,810	779	28,489	2,180
Averages										
1983-1997	N/A	N/A	N/A	648	N/A	2,614	N/A	3,338	N/A	7,089
1988-1997	270	11	2,973	680	16,546	2,727	19,788	3,418	37,128	7,329
1993-1997	372	2	4,374	924	23,163	3,358	27,910	4,284	45,109	7,919

^a Tolovana and Chatanika rivers, and Minto Flats.

NA = data not available

Table 21.-Estimated (Provisional) angling effort (number of angler-days) in Minto Flats, 1977-1998.

Year	Minto Flats
1977	3,886
1978	3,640
1979	2,709
1980	2,727
1981	2,045
1982	1,791
1983	1,281
1984	1,829
1985	2,011
1986	3,318
1987	1,539
1988	1,564
1989	699
1990	932
1991	1,532
1992	2,401
1993	3,911
1994	6,267
1995	6,260
1996	3,917
1997	3,354
1998	1,414
Averages	
1977-97	2,743
1988-97	3,084
1993-97	4,742

Stock assessments were done at Minto Flats almost annually between and after 1987, and most recently in 1997. Improvements in methodology produced better abundance estimates over the years (Roach, 1998). The Minto Lakes area is the study area within which stock assessment takes place, and because it receives most of the angler use, is an appropriate index of population status. The 1997 estimated abundance of northern pike in the Minto Lakes over 400 mm in length was about 16,500. Radiotelemetry studies of movement and distribution were done in 1987, 1988, 1993 and 1995 - 1997. In addition to documenting movements and overwintering areas, these studies documented fidelity to specific areas, which verified assumptions used in abundance estimates (Roach 1998).

1998 SUMMARY

Abundance estimation was not done at Minto Flats during 1998. Effort declined (Table 20). Low water levels limiting river access probably contributed to the decline in effort. Catch and harvest also declined, but examination of Table 21 indicates that provisional catch rate did not.

FISHERY MANAGEMENT OBJECTIVES

The Minto Flats Sport Fishery Management Plan sets out objectives of ensuring sustainable harvest and incidental fishing mortality; annual angler effort of 3,000 days per year; and maintenance of public access. The Minto Flats Northern Pike Management Plan adopted by the Board of Fisheries in 1997 (5 AAC 70.044) sets the maximum annual exploitation rate for northern pike in Minto Flats by all users less than 20%. Also, should more than 750 northern pike be harvested in Goldstream Creek between January 1 and breakup, an E.O. must be implemented reducing the daily bag and possession limit to two pike per day, only one of which can be in excess of 30 inches in total length.

FISHERY MANAGEMENT ACTIVITIES/RESULTS

Catch rates seem sustainable and exploitation is in compliance with the management plans under the present regulatory regime.

BOF ACTIONS

Recent BOF actions are described in the fisheries objectives section. No BOF actions involving Minto Flats occurred in 1998.

FISHERY OUTLOOK

Effort should increase if water levels in the rivers of Minto Flats rise to normal stages, restoring boat access.

ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES

Catch, harvest, and to a certain extent effort will be monitored through the SWHS. Stock status assessment work should be undertaken at least every three years, in conjunction with the BOF cycle.

SECTION XII: HARDING LAKE NORTHERN PIKE FISHERY

BACKGROUND AND HISTORICAL PERSPECTIVE

Harding Lake is located in the central Tanana Valley, about four miles southeast from the confluence of the Salcha and Tanana rivers. The Salcha River passes just north of Harding Lake, and the broad, braided floodplain of the Tanana River passes just to the west. The lake is about

35 miles southeast in a straight line and about 45 road miles on the Richardson Highway from Fairbanks. It is the largest, deepest, and most accessible of the four large roadside lakes (Birch, Harding, Chena, and Quartz lakes) in the central Tanana Valley and until Chena Lake was constructed, Harding Lake was the closest to Fairbanks. Harding Lake has been used for all types of aquatic recreational activity over the years, including fishing (Doxey 1991).

Harding Lake is generally circular in shape, except for a prominent point in the middle of the southern shoreline, and is surrounded by forested hills. Surface elevation is about 715 ft, surface area is 2,500 acres, and maximum depth is 144 ft. Watercolor is transparent green, and the lake is oligotrophic and relatively unproductive (LaPerriere 1975). There is no outlet. The lake is fed by hillside runoff, a few springs, and two inlets. A small inlet drains the adjacent Little Harding Lake basin. The east inlet (Rogge Creek) drains a larger basin (approx. 6,400 acres) to the east. The channel of Rogge Creek comes to a divide at which the water periodically flows into either Harding Lake or the Salcha River. When the channel shifts such that the water flows toward the Salcha River, the lake volume and level is stable or it declines depending on annual precipitation. When Rogge Creek flows into the lake, the lake volume and level remains stable or rises. When the lake level drops, the majority of the wetlands along the shoreline (principally the northern shoreline) dry up. This happened in the mid-1970s and is happening again in the late 1990s. This phenomenon and its implications are described and quantitatively assessed in Nakao 1980, Kane 1979, and Doxey 1991, as are more complete descriptions of the lake.

Harding Lake is very accessible. About 75% of the shoreline is ringed with lakefront cabins which are road-connected to the Richardson Highway. There is a large State campground with a major boat launching area, and several other small public access right-of-ways and private boat launches. The boat launches become progressively more unusable when the lake level recedes, reducing angler access.

Indigenous fish species are northern pike *Esox lucius*, burbot *Lota lota*, least cisco *C. sardinella*, and slimy sculpins *Cottus cognatus*. Introduced species are lake trout *Salvelinus namaycush* and Arctic char *Salvelinus alpinus*. The lake trout are naturally reproducing and augmented by small additions of hatchery fish. Natural reproduction of the Arctic char has not yet been documented and the fishery is entirely sustained by stocked fish.

The northern pike are a high profile game fish in Harding Lake because they are readily caught and their preference for shallow water habitats makes them highly visible to anglers. This is in contrast to the other large predators (burbot, lake trout, and Arctic char), which are available to anglers as lower density populations in deep water.

As northern pike generally increased in popularity as a game fish (Doxey 1991) and anglers became more aware of their presence in Harding Lake, harvests increased through the 1980s (Table 22). Harvests fell dramatically during the early 1990s in part due to regulatory changes and declined again in provisional estimates after 1995. In 1991, pike fishing at Harding Lake was closed between April 1 and May 31, spear fishing was closed, and a 26 inch minimum length limit was imposed. Catches peaked in 1993 at about 8,500 fish and declined slowly thereafter to about 2,600 in 1997.

Although effort is not estimated by target species (fishery), it is felt that the majority of the effort at Harding Lake is directed toward northern pike. Estimated effort at Harding increased through the mid-1980s and ranged around 5,000 angler-days from 1990 to 1994 (Table 23). Provisional estimates of effort increased in 1995 and 1996, then declined in 1997.

Table 22.-Sport catch and harvest of northern pike in Harding Lake and in the LTMA, 1983-1998 (Provisional).

Year	Harding Lake		LTMA Total	
	Catch	Harvest	Catch	Harvest
1983	N/A ^a	178	N/A	7,898
1984	N/A	766	N/A	6,357
1985	N/A	503	N/A	8,224
1986	N/A	673	N/A	8,112
1987	N/A	1,886	N/A	6,105
1988	N/A	2,092	N/A	7,599
1989	N/A	1,764	N/A	8,310
1990	3,629	591	23,964	5,414
1991	5,071	1,888	23,037	9,426
1992	3,400	341	24,477	4,200
1993	8,471	391	41,809	7,743
1994	5,559	539	76,372	13,200
1995	3,852	502	43,578	10,581
1996	4,070	363	34,867	4,890
1997	2,578	62	28,290	3,181
1998	3,051	139	28,489	2,180
Averages				
1983-1997	4,579	585	37,128	7,329
1988-1997	4,409	535	36,168	6,757
1993-1997	4,906	371	45,109	7,919

^a NA = data not available

Table 23.-Estimated (Provisional) angling effort (number of angler-days) at Harding Lake, 1983-1998.

Year	Harding Lake
1983	708
1984	1,707
1985	850
1986	2,064
1987	5,125
1988	3,256
1989	4,935
1990	3,895
1991	5,155
1992	5,068
1993	4,885
1994	4,913
1995	6,743
1996	6,734
1997	3,403
1998	3,410
Averages	
1983-97	3,963
1988-97	4,899
1993-97	5,336

Abundance estimates for Northern pike were conducted at Harding Lake annually during the period 1991-1998 except in 1994. Abundance of northern pike over 300 mm in total length increased from about 2,300 in 1991 to about 3,800 in 1993. Estimated abundance increased between 1995 and 1996, from 2,338 to 3,337, but declined to 1,780 in 1997 (Roach, 1998).

1998 SUMMARY

Effort remained stable in 1998 at about 3,400 days fished (Table 23), and catch and harvest of northern pike increased slightly (Table 22). The abundance estimate for 1998 was about 1,400 fish over 300 mm, which is a decline of about 16% from the estimate of 1997, and a decrease of about 44% from the average of the seven population estimates done between 1990 and 1997 (Roach and McIntyre 1999) and was the smallest since assessment efforts have been done.

FISHERY MANAGEMENT OBJECTIVES

The fishery management objectives outlined for Harding Lake northern pike are essentially the background sport fisheries management objectives for all species targeted by recreational anglers - to manage them on a sustainable basis.

FISHERY MANAGEMENT ACTIVITIES/RESULTS

The declining population of adult northern pike in Harding Lake is indicative of a situation that may not be controllable under the present regulatory structure, although harvest is minimal.

BOF ACTIONS

There have been no recent BOF actions regarding this fishery.

FISHERY OUTLOOK

It is likely that the department will consider some regulatory action to stop the decline in abundance.

ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES

In 1998 a risk analysis was completed as part of the research studies on the Harding Lake northern pike population. The risk analysis assessed the likely ability of various regulatory regimes to maintain the northern pike spawning population at about 1,728 fish, the abundance calculated to produce maximum sustained yield (about 400 fish). The recommendation was to increase the minimum length limit from 26 inches to 30 inches (Roach and McIntyre 1999).

Catch, harvest, and effort will be monitored through the SWHS.

SECTION XIII: OTHER NORTHERN PIKE FISHERIES

BACKGROUND AND HISTORICAL PERSPECTIVE

Pike are common in many smaller lakes and in sloughs and tributaries of the Tanana River, and small harvests are reported annually from many locations throughout the LTMA. The lower Chena, Zitziana, and Salcha Rivers, Piledriver Slough, and gravel pits in south Fairbanks and on Eielson are examples of the types of areas that produce northern pike for anglers. Other fisheries occur in lakes in the Kantishna River drainage (such as East Twin and Mucha) and in clear boat-accessible sloughs, backwaters, and small tributaries off of the Tanana River. Fish Creek, a small system downriver from Manley, produced a pike that held the State Record for many years. The northern pike present in the river system and in waters connected to the river provide

the population reservoir which, through the movements of individual fish, ensures the continued viability of small stocks and availability of fishing opportunity wherever suitable habitat occurs. This includes the colonization of ponds. Northern pike colonize suitable gravel pits and other ponds either when the river floods them or the pits are connected to the river, or when people illegally introduce northern pike into those waters. Many of these areas are road-accessible. None of these produce large numbers of fish or very many large fish, but collectively they provide about one-third of the catch and about one-half of the harvest of northern pike in the LTMA (Table 24). No particular catch and harvest trends are discernible, particularly given the provisional nature of the data. It is not presently possible to develop a direct estimate of effort because of the mixed stock fisheries of which these pike fisheries are a part. However, effort can be inferred from catch. It is safe to assume that the large majority of effort at Minto Flats is directed toward northern pike. Provisional 5-year average effort in Minto Flats is 4,742 angler days. Provisional 5-year average catch rate for northern pike in Minto Flats is 4.9 fish per day (Tables 19 and 20). It is also safe to assume that the collective catch rate (fish per angler day) for northern pike in the small LTMA fisheries is no better than that of Minto Flats. The 5-year provisional average annual catch for these small fisheries is 12,294 pike. That catch divided by the best possible catch rate (Minto Flats) indicates an annual average effort of about 2,500 angler-days. The catch rate for the small fisheries is likely much less than that of Minto Flats, so the estimate of 2,500 days is a minimum. The wide range of accessibility for anglers, and the diversity of types of angling opportunity (from that available at roadside picnic or swimming spots to waters only accessible by boat or airplane) add value to these fisheries. Angler interest in road accessible northern pike fisheries is high. However, the nature of northern pike as a voraciously piscivorous top-predator that takes the hook readily but requires many years to grow to the larger sizes valued by anglers makes it difficult to manage for high quality pike fisheries in roadside situations.

Abundance and age and sex composition studies were conducted in East Twin Lake in 1993 (Pearse 1994) and Deadman Lake in 1994 (Hansen and Pearse 1995). In both cases the populations were judged to be healthy and capable of sustaining existing harvest levels. A radiotelemetry study done in 1993 and 1994 in the Chena River indicated that adult northern pike in that river move little during the year, although difficulties with some aspects of the studies caused the results to be somewhat qualified (Pearse 1994).

1998 SUMMARY

Catch increased and was above the 5-year average, while harvest continued a slow decline. Whether the harvest decline is a result of angler's inclination to engage in more catch and release fishing or the average size of northern pike is declining to a level undesirable to anglers is unknown.

FISHERY MANAGEMENT OBJECTIVES

Management on a sustainable basis is an overriding obligation. However, in roadside ponds stocked with salmonids such as rainbow trout, where northern pike have been illegally introduced, maximum harvest rate is beneficial.

FISHERY MANAGEMENT ACTIVITIES/RESULTS

In 1992, northern pike fishing in lakes of the Tanana drainage was closed during all of April and May to protect pike just prior, during, and immediately after spawning. This closure was

Table 24.-Sport catch and harvest of northern pike in the LTMA waters other than Minto Flats and Harding Lake, and LTMA totals, 1983-1998 (Provisional).

Year	Other Lakes and Streams		LTMA Total	
	Catch	Harvest	Catch	Harvest
1983	N/A ^a	4,259	N/A	7,898
1984	N/A	2,463	N/A	6,357
1985	N/A	2,465	N/A	8,224
1986	N/A	951	N/A	8,112
1987	N/A	1,818	N/A	6,105
1988	N/A	3,542	N/A	7,599
1989	N/A	3,950	N/A	8,310
1990	14,275	2,814	23,964	5,414
1991	11,855	4,952	23,037	9,426
1992	14,492	2,534	24,477	4,200
1993	8,960	3,932	41,809	7,743
1994	18,622	3,172	76,372	13,200
1995	10,533	5,599	43,578	10,581
1996	14,318	1,811	34,867	4,890
1997	9,034	1,803	28,290	3,181
1998	17,628	1,262	28,489	2,180
Averages				
1983-1997	12,761	3,327	37,128	7,329
1988-1997	13,302	3,098	36,168	6,757
1993-1997	12,294	3,263	45,109	7,919

^a NA = data not available

subsequently judged to be unnecessarily restrictive, and in 1997 the BOF adopted a revision leaving most all lakes except Harding Lake open until April 20, then closed until June 1.

BOF ACTIONS

There have been no BOF actions since 1997.

FISHERY OUTLOOK

Angler interest in opportunities to utilize the small roadside fisheries remains high, and the pike stocks in waters not connected to the river will not meet the demand. Northern pike in road accessible waters connected to the river system will continue to provide a steady but relatively low level of opportunity. Northern pike populations in remote waters will continue to provide higher-quality opportunities for the foreseeable future.

ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES

Catch, harvest, and to a certain extent effort will be monitored through the SWHS. Assessment work on remote fisheries should be undertaken.

SECTION XIV: LTMA BURBOT FISHERY

BACKGROUND AND HISTORICAL PERSPECTIVE

Burbot are found in suitable habitat throughout the Yukon River drainage in Alaska (and throughout the rest of the State except in Southeast Alaska). The Tanana River is the mainstem glacial river that drains the Tanana Valley and contributes those waters to the Yukon River. It is utilized by burbot during all phases of their life history. The Tanana River is also utilized by humans as a transportation corridor during both winter and summer. Within the LTMA the Tanana River is accessible from many communities, long stretches of the road system, and tributary streams and rivers with adjacent communities and road systems. LTMA communities to which the Tanana River is very important include Salcha, North Pole, Fairbanks, Nenana, and Manley.

Within the LTMA burbot occur in the Tanana River and lower sections of clear tributaries such as the Chena, Lower Chatanika, Salcha, and Tolovana rivers, and in deeper lakes such as Harding Lake and West Twin Lake. They can also colonize suitable ponds and gravel pits when flooding from the river occurs. Burbot are a member of the cod family (Gadidae), and are valued by LTMA residents for the quality of their flesh. Fishing occurs year-round, but the majority of the effort in the LTMA appears to occur in fall and winter. The most common gear type in flowing waters of the drainage is set lines, on which up to 15 hooks may be used, but hand held gear is used by anglers in lakes and to a certain extent in rivers. Burbot stocks in the Tanana River system are harvested most heavily near population centers such as Fairbanks, North Pole, and Nenana. Population assessments have been conducted annually since the late 1980s in the Lower Chena River and the Tanana River near Fairbanks, where the most intensive river fishery occurs. Radiotelemetry studies have also been conducted. Extensive movements and exchange of burbot within the Tanana River drainage tends to minimize effects of concentrated local fishing effort, and overall stocks in the Tanana River appear to be lightly exploited (Evenson 1997).

Although exploitation rates of burbot in the Tanana River are not considered excessive, studies suggest low abundance in most of the easily accessible lakes examined within the Tanana drainage. Population density of burbot in many lakes declined dramatically in the early 1980's

due to unsustainable rates of sport fishing exploitation. More recent stock assessment studies conducted in lakes of the Tanana River drainage demonstrate the detrimental effects of long-term high exploitation rates on stocks (Parker 1998). Stock assessments in (easily accessible) Harding Lake (Lafferty et al. 1992) have precipitated regulatory restrictions. Set lines may not be used in Harding Lake, and in other lakes in the LTMA where set lines are allowed, they may only be used in winter. Bag and possession limit in Harding Lake is two fish.

While most of the effort in the Tanana River fishery is probably directed toward burbot, it can be difficult to make inferences about effort in the burbot fisheries because the fisheries are mixed-stock fisheries. The variable fishing power of the allowable gear-types for burbot confound inferences based on estimated catch. The SWHS bases its estimates on calendar years, which divide the winter fishery into two segments and assigns the first portion to the end of one year and the second portion to the beginning of the next. The impact of early winter weather conditions, timing of freeze-up, etc on effort are thus combined with the second part of the previous winter. Anglers fish for burbot all winter, and casual observations indicate that effort increases as the ice becomes safer to travel on in November, declines in late December, and climbs again after mid-January. This decline coincides with the darkest, coldest time of the year, and with the general timing of burbot spawning in the rivers.

Comparison of Table 25 with the SWHS estimates (Howe et al. 1998) indicates that the LTMA burbot fishery provides well over half of the statewide burbot catch and harvest annually. The estimated catch of burbot in the LTMA varies from year to year within a range of about 2,000 to 4,000. The 5-year average harvest is 79% of the catch, which is higher than any other fishery in the Tanana drainage, indicating the value of this fishery as providing food for Interior residents (Table 5). The Tanana River and the Lower Chena River fisheries provide most of the catch and harvest in the LTMA. These fisheries are on the same stock of burbot, which could be characterized as a "middle Tanana" stock.

1998 SUMMARY

Estimated catch and harvest in 1998 were below the 1993 - 1997 five-year provisional average but were within the range of annual provisional estimates of catch and harvest for those years. The 1998 population assessment indicated that the burbot population parameters were within the range measured in previous years (Stuby and Evenson, 1999).

FISHERY MANAGEMENT OBJECTIVES

The Management objective for the Tanana River and LTMA lakes is to ensure that harvests and incidental mortality of burbot are sustainable. Healthy stocks such as the Tanana River burbot are managed to permit maximum sustained yield while depressed stocks such as in road accessible lakes, are managed to allow the stocks to rebuild.

FISHERY MANAGEMENT ACTIVITIES/RESULTS

The restrictive regulations (possibly combined with low abundance) in Harding Lake have kept harvest low there. The bag and possession limit of 15 fish in rivers seems to be allowing the stock to sustain itself at the current level of fishing effort.

BOF ACTIONS

No regulatory matters were brought before the Board of Fish during the 1997 cycle.

Table 25.-Sport harvest and catch of burbot in the LTMA, 1983-1998 (Provisional).

Year	Harding Lake		Chena River		Tolovana River & Minto Flats		Chatanika River		Piledriver Slough	
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest
1983	N/A ^a	157	N/A	1,055	N/A	0	N/A	21	N/A	84
1984	N/A	428	N/A	1,233	N/A	39	N/A	13	N/A	0
1985	N/A	0	N/A	2,065	N/A	105	N/A	175	N/A	70
1986	N/A	0	N/A	884	N/A	433	N/A	40	N/A	0
1987	N/A	53	N/A	149	N/A	132	N/A	13	N/A	79
1988	N/A	73	N/A	386	N/A	0	N/A	55	N/A	55
1989	N/A	10	N/A	1,322	N/A	20	N/A	10	N/A	100
1990	17	17	338	304	0	0	17	17	456	456
1991	45	45	609	225	56	56	0	0	237	203
1992	17	17	1,235	1,032	0	0	17	8	203	195
1993	0	0	1,328	1,135	0	0	0	0	760	568
1994	31	31	685	592	218	208	0	0	135	73
1995	46	46	1,045	597	172	161	206	91	500	299
1996	133	80	540	441	18	18	9	9	117	80
1997	42	42	735	703	189	42	274	243	126	126
1998	8	0	1,144	854	17	0	0	0	143	135
Averages										
1983-1997	N/A	56	N/A	795	N/A	81	N/A	45	N/A	163
1990-1997	41	35	814	629	82	61	65	46	317	250
1993-1997	50	40	867	694	119	86	98	69	328	229

Table 25.-Page 2 of 2.

Year	Nenana River		Middle and Lower Tanana River		Other		LTMA Total	
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest
1983	N/A	N/A	N/A	1,652	N/A	346	N/A	3,315
1984	N/A	N/A	N/A	1,210	N/A	208	N/A	3,131
1985	N/A	N/A	N/A	860	N/A	256	N/A	3,531
1986	N/A	53	N/A	1,236	N/A	431	N/A	3,077
1987	N/A	132	N/A	1,302	N/A	346	N/A	2,206
1988	N/A	0	N/A	1,335	N/A	0	N/A	1,904
1989	N/A	60	N/A	1,301	N/A	140	N/A	2,963
1990	68	68	961	838	844	507	2,701	2,207
1991	11	11	857	683	150	150	1,965	1,373
1992	102	76	1,323	981	75	59	2,972	2,368
1993	21	11	1,814	1,635	241	135	4,164	3,484
1994	0	0	2,063	1,626	21	21	3,153	2,551
1995	0	0	2,120	1,684	229	172	4,318	3,050
1996	44	44	818	537	256	169	1,935	1,378
1997	42	42	1,949	2,403 ^b	96	82	3,453	3,683 ^b
1998	25	25	1,262	876	329	200	2,928	2,090
Averages								
1983-1997	N/A	40	N/A	1,234	N/A	192	N/A	2,600
1990-1997	36	32	1,488	1,298	239	162	3,083	2,512
1993-1997	21	19	1,753	1,577	169	116	3,405	2,829

^a NA = data not available^b Harvest exceeds catch due to partial updating of provisional miscalculated data.

FISHERY OUTLOOK

The fishery should remain stable. Increased participation would increase harvest, but angler interest in this fishery appears to be steady.

ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES

Catch, harvest, and to a certain extent effort will be monitored through the SWHS. Assessment efforts are being reduced. Should trend information develop that indicates that the fishery is changing, assessment should be reinstated to evaluate stock status.

SECTION XV: CHATANIKA RIVER WHITEFISH FISHERY

BACKGROUND AND HISTORICAL PERSPECTIVE

During late summer and fall, humpback whitefish and least cisco migrate up the Chatanika River to spawn in the middle section of the river between Hard Luck Creek and a few miles upstream of the Elliot Highway bridge. They then move downriver to as yet undefined overwintering areas. It's quite possible that some of overwintering areas are outside of the Minto Flats complex. Fleming (1999) describes the potential compound life history of the stocks, which might include long migrations in the Tanana and Yukon rivers. During the course of northern pike research, humpback whitefish and least ciscos have been observed moving into the Minto Lakes immediately after breakup. They likely feed for a period of time during the summer before moving on to spawning areas.

The only major sport fishery for whitefish in the LTMA was the spear fishery on the Chatanika River in the vicinity of the Elliot Highway bridge. This fishery took place in September, while least cisco and humpback whitefish were migrating upstream to spawn. Both of these species were harvested, as were a small percentage of round whitefish. Harvests during the late 1970s were generally under 5,000 fish, but the fishery became very popular during the 1980s, and harvests had increased to 25,000 by 1987 (Table 26).

This fishery had no bag limit until 1988, when a 15 fish per day limit was implemented. Harvest decreased in 1988 after the bag limit was imposed, but increased again in 1989. Declines in abundance combined with harvest estimates that were considered unsustainable prompted the department to close the fishery by emergency order on October 10 of 1990, and again on September 9 of 1991. In February of 1992, the Board of Fisheries adopted a department proposal to limit the fishery to the month of September, and to limit the area where the fishery took place to downstream of a point one mile above the Elliot Highway bridge.

During 1992, the department also adopted a management plan that set threshold abundance levels required to allow harvest. The threshold abundance level for humpback whitefish is 10,000 spawners, and the threshold abundance level for least cisco is 40,000 spawners. Stock assessment done in 1992 indicated abundance levels above the threshold levels in the management plan (Table 27), and the fishery was open during 1992, but an extremely early winter resulted in low participation in the fishery that year, and harvest barely exceeded 2,000. Stock assessment in 1993 also indicated abundance levels above the threshold levels allowing harvest, and the fishery remained open, but harvest levels were again very low. The low harvest in 1993 was attributed to heavy rainfall and flooding which persisted during much of the spear fishery, creating high turbid water conditions which made spearing difficult. Stock assessment during 1994 indicated that the abundance level of least cisco was below the management plan

Table 26.-Sport catch and harvest of whitefish in the Chatanika River and the LTMA, 1977-1998 (Provisional).

Year	Chatanika River		LTMA Total	
	Catch	Harvest	Catch	Harvest
1983	N/A ^a	5,895	N/A	7,436
1984	N/A	9,268	N/A	10,472
1985	N/A	14,350	N/A	18,480
1986	N/A	22,038	N/A	26,995
1987	N/A	25,074	N/A	25,937
1988	N/A	7,983	N/A	9,123
1989	N/A	15,542	N/A	16,688
1990	5,334	5,216	8,014	6,299
1991	23	0	619	356
1992	2,033	2,033	3,140	2,810
1993	558	558	948	722
1994	436	97	1,677	242
1995	71	9	1,187	578
1996	320	46	660	149
1997	147	27	1,367	774
1998	60	0	1,258	450
Averages				
1983-1997	N/A	N/A	N/A	8,545
1990-1997	1,115	N/A	2,202	1,491
1993-1997	306	N/A	1,168	493

^a NA = data not available.

Table 27.-Humpback whitefish and least cisco abundance estimates from the Chatanika River, 1992-1997^a.

Assessment Year:	Humpback Whitefish	Least Cisco
1992	19,187 fish (SE = 1,617)	75,035 fish (SE = 8,555)
1993	13,112 fish (SE = 1,096)	46,562 fish (SE = 5,971)
1994	12,700 fish (SE = 1,138)	27,639 fish (SE = 3,211)
1995	N/A ^b	NA
1996	NA	NA
1997	16,107 (SE = 1,260)	22,811 (SE = 4,496)

^a Data from Fleming (1997).

^b NA = data not available.

threshold allowing harvest, and the fishery was closed by emergency order on September 5, 1994. The whitefish fishery on the Chatanika River has been closed by emergency order since that date. Harvest has been minimal, and may be from anglers hook-and-line fishing who do not realize that the current closure affects all harvest, not just spear fishing. Abundance estimates for whitefish in the Chatanika were not conducted in 1995 or 1996, but estimates of stock composition were obtained in 1996 (Fleming, 1997) and an abundance estimate was done in 1997 (Fleming, 1997). Abundance of humpback whitefish increased in 1997 above the levels of 1993 and 1994, but the estimate for least cisco was below estimates for 1993 and 1994, and was almost 70% lower than the 1992 estimate (Table 27). Although the spawning population of humpback whitefish has recovered, and that stock is showing good recruitment of younger age classes, stock composition data showed a continuing decline in the number of three-year-old least cisco. Whereas stock assessment between 1992 and 1994 showed three year-old least cisco making up over 30% of the total estimate, three year-olds only represented 14% of the 1997 sample, and only 5% of the 1997 abundance estimate. This recruitment failure will result in a weak year class that will slow any stock rebuilding.

1998 SUMMARY

No abundance estimate for whitefish in the Chatanika River was conducted during 1998. Stock monitoring in late summer of 1998 indicated that the growth of the humpback whitefish spawning stock through recruitment had slowed, and that there were slight improvements in recruitment to the least cisco spawning stock (Fleming 1999). The fishery remained closed. Fleming described possible causes of natural mortality that might be reducing recruitment, including severe winter conditions in spawning areas, sub-optimum hydrological conditions, and predation.

FISHERY MANAGEMENT OBJECTIVES

The whitefish fishery on the Chatanika River is managed under the Chatanika River Sport Fisheries Management Plan written and adopted in 1992. The objectives of the Plan are to ensure that harvests and incidental mortality of whitefish are sustainable, to increase participation in the recreational fishery (for all species) to 15,000 angler-days by 1995, and to ensure that public benefits derived from the fisheries on the Chatanika River outweigh the costs of fishery management. The plan sets threshold abundance levels for both humpback whitefish and least cisco below which no harvest is allowed, and a range of maximum exploitation rates depending on the threshold abundance for that species. The threshold abundance level for humpback whitefish is 10,000 spawners, and the maximum exploitation rate is from 10 to 15%. The threshold abundance level for least cisco is 40,000 spawners, and maximum exploitation rate is from 20% to 25%.

FISHERY MANAGEMENT ACTIVITIES/RESULTS

The closure has ended utilization of these stocks by all except subsistence fishermen. The stocks are being allowed to rebuild, and it is proceeding slowly.

BOF ACTIONS

There were no proposals related to whitefish in the Tanana River drainage before the Board of Fish in 1997, and no Board action was taken relating to whitefish in the Tanana drainage.

FISHERY OUTLOOK

Because the stock of least cisco in the Chatanika has not been rebuilding, and research indicates that a recruitment failure took place in 1997, it is unlikely that abundance levels of least cisco will reach the threshold level set to allow harvest in 1999.

ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES

Stock assessment of whitefish was not done on the Chatanika River during 1995. In 1996, size and age composition was estimated, and during 1997, an abundance estimate was done. A stock composition sample was taken as well during 1998. Because the current emergency order closing the fishery remains in effect until superceded by a new emergency order, no management action was taken relating to the Chatanika whitefish fishery between 1995 and 1998. The Department provides news releases and other public information to ensure that the fishing public is aware that the fishery remains closed.

The current closure of the whitefish fishery at the Chatanika River closes the fishery to all methods of fishing, including hook-and-line. Differences between reported catches and harvests of whitefish from the Chatanika River since it has been closed in 1994 indicate that some anglers may be unaware of this aspect of the closure, and are hook-and-line fishing. Because the spawning stock of humpback whitefish in the Chatanika is above the threshold level in the Management Plan set to allow harvest, and because hook-and-line fishing would allow anglers to selectively harvest only humpback whitefish, the department should consider amending the current closure to allow to hook-and-line fishing for humpback whitefish in the Chatanika River. Research on whitefish stocks in the Chatanika River should be limited to estimating stock composition until this research indicates that stocks may be rebuilding and an abundance estimate is needed to confirm the recovery.

SECTION XVI: OTHER WHITEFISH FISHERIES

BACKGROUND AND HISTORICAL PERSPECTIVE

Besides the Chatanika River, harvests and catches of whitefish from the LTMA that are consistently reported in the SWHS come from the Chena, Salcha, and Tanana rivers. These fisheries may involve spearing of fish migrating to spawning grounds in the fall and some hook-and-line angling. Round whitefish share a common habitat preference with grayling and are abundant in many areas where anglers fish for grayling. They are occasionally taken with rod and reel, as are humpback whitefish. Least ciscos rarely take a hook. Of the fisheries other than the Chatanika River, the Chena and Tanana rivers have accounted for the largest harvests. Harvest after the late 1980's in the Chena River declined sharply when the use of bait on small hooks was prohibited as part of a regulatory package protecting Arctic grayling. Given their wide distribution and low catch rate, whitefish are judged to be an underutilized resource at this time.

Although it has been felt in the past that there was very little hook-and-line angling for whitefish in the LTMA, and that most harvests and effort involved spear fisheries, estimated catches in many cases are much higher than estimated harvests (Table 28). This clearly indicates that a substantial portion of the catch is caught with hook-and-line, and is subsequently released. These data also indicate that although the fishery for whitefish on the Chatanika River was

Table 28.-Sport catch and harvest of whitefish in the LTMA, 1977-1998 (Provisional).

Year	Chena River		Chatanika River		Salcha River		Tanana River		Other Locations		LTMA Total	
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest
1983	N/A ^a	1,064	N/A	5,895	N/A	94	N/A	13	N/A	370	N/A	7,436
1984	N/A	883	N/A	9,268	N/A	117	N/A	33	N/A	171	N/A	10,472
1985	N/A	3,780	N/A	14,350	N/A	35	N/A	0	N/A	315	N/A	18,480
1986	N/A	1,954	N/A	22,038	N/A	783	N/A	801	N/A	1,419	N/A	26,995
1987	N/A	56	N/A	25,074	N/A	277	N/A	128	N/A	402	N/A	25,937
1988	N/A	790	N/A	7,983	N/A	0	N/A	41	N/A	309	N/A	9,123
1989	N/A	603	N/A	15,542	N/A	362	N/A	28	N/A	153	N/A	16,688
1990	287	136	5,334	5,216	68	68	112	0	2,213	879	8,014	6,299
1991	137	34	23	0	0	0	26	26	433	296	619	356
1992	212	129	2,033	2,033	28	0	276	261	591	387	3,140	2,810
1993	148	96	558	558	17	9	31	0	194	59	948	722
1994	249	0	436	97	58	19	90	29	844	97	1,677	242
1995	436	155	71	9	54	0	12	12	614	402	1,187	578
1996	150	18	320	46	35	0	0	0	155	85	660	149
1997	442	323	147	27	532	270	106	67	140	87	1,367	774
1998	424	83	60	0	8	8	13	13	753	346	1,258	450
Averages												
1983-1997	N/A	640	N/A	7,303	N/A	139	N/A	102	N/A	362	N/A	8,545
1990-1997	258	111	1,115	998	99	46	82	49	648	287	2,202	1,491
1993-1997	285	118	306	147	139	60	48	22	389	146	1,168	493

^a NA = data not available.

almost entirely a spear fishery, catches at many other locations were probably from hook-and-line fisheries.

1998 SUMMARY

LTMA whitefish catch (1,168) and harvest (450) in 1998 were near the 5-year average, and indicative of a low-level fishery.

FISHERY MANAGEMENT OBJECTIVES

The background management objective for the LTMA whitefish outside of the Chatanika River is to ensure that harvests (are sustainable) and incidental mortality is minimized.

FISHERY MANAGEMENT ACTIVITIES/RESULTS

Anglers are encouraged to fish for whitefish and to look for other stocks that might provide opportunity for fall spear fishing. Because of ongoing interest, it is possible that new spear fisheries may emerge on small stocks of whitefish in some of the clearwater tributaries of the Tanana River, and reported harvest levels should be watched in future years, especially from those streams that are easily accessible.

To date there has been little success at developing spear fisheries on other stocks.

BOF ACTIONS

No regulatory matters concerning whitefish were brought before the Board of Fish during the 1997 cycle.

FISHERY OUTLOOK

The fishery should remain stable. Increased participation would increase harvest, but angler interest in this fishery appears to be steady. There remains a segment of the angling public who desire to participate in a spear fishery for whitefish in the Tanana drainage. The department receives inquiries each fall as to whether or not the Chatanika will open to spearing that year. Because of this ongoing interest, it is possible that new spear fisheries may emerge on small stocks of whitefish in some of the clearwater tributaries of the Tanana River, and reported harvest levels should be monitored in future years, especially from those streams that are easily accessible.

ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES

Catch, harvest, and to a certain extent effort will be monitored through the SWHS. Assessment efforts are being reduced. Should trend information develop that indicates that the fishery is changing, assessment should be reinstated to evaluate stock status.

Whitefish are highly migratory. In the Tanana and Yukon rivers there are subsistence and personal use fisheries. There is little information available describing the relationship between whitefish stocks available to and utilized by LTMA anglers and those utilized within other fisheries. Research projects should be developed and implemented to delineate the life history patterns of Tanana drainage whitefish.

SECTION XVIII: STOCKED WATERS FISHERIES

BACKGROUND AND HISTORICAL PERSPECTIVE

This section briefly describes the harvest and effort trends and issues for LTMA stocked waters. The Region III stocked waters staff produces detailed Annual Management Reports describing the stocking program from a perspective of both Region III and by Management Area. The forthcoming report will complement this Area Management Report with sections describing the interesting history and outstanding results (particularly during the period from 1979 to 1998) of the stocking program within the LTMA (Skaugstad *In prep*).

The program of stocking hatchery produced fish to augment angling opportunity in Alaska began in 1952 when lakes along the road system near Fairbanks were stocked with rainbow trout and coho salmon. The first sport fish hatchery in Alaska (then the Territory of Alaska) was constructed at Birch Lake in 1952 and remained in operation until the 1960's. Subsequently hatcheries at Fire Lake, Ft. Richardson, Elmendorf AFB, Clear Air Force Station, and other locations supplied fish to LTMA waters. Presently the Ft. Richardson and Elmendorf hatcheries are in operation and supply the stocked production for Interior Alaska.

The hatcheries presently produce rainbow trout, chinook and coho salmon, Arctic grayling, Arctic char, and lake trout for stocking into LTMA waters. Experimental groups of sheefish and chinook - coho hybrids have been produced and stocked into LTMA waters, and sockeye salmon from the Gulkana Hatchery were stocked into Harding Lake for two years. Those species were found to be cost-ineffective and production was discontinued.

At present a total of 54 lakes are stocked in the LTMA. They range in size from Harding Lake at about 2,500 acres to small urban ponds less than 1 acre in surface area. Piledriver Slough is the only stream stocked, with (sterile) rainbow trout. The stocked waters offer opportunities ranging from neighborhood urban ponds and large and small roadside lakes through remote lakes that are only trail-accessible, sometimes only in winter, to a few remote lakes only accessible by airplane. Within the spectrum of fisheries management needs within the LTMA they function to provide additional and more diverse angling opportunity and to shift pressure from and provide harvest alternatives for wild stocks. Perhaps one of the most important aspects of the diversity provided is the major, sustainable opportunity for winter fishing.

Fish are stocked at four sizes: fingerling (2 grams), subcatchables (20 - 60 grams), catchables (100 - 200 grams) and surplus broodstock (rainbow trout only, up to 1500 grams). Size at stocking depends on management needs for the particular stocking location and hatchery production capability. For example, catchables are stocked in roadside and urban ponds because the angler use of such places produces demand far in excess of the production capacity of the pond to sustain the fishery with fingerling stockings. Conversely, fingerlings are stocked into remote lakes because those lakes have the productivity to meet the lower demand and it is too expensive to transport larger fish with aircraft.

Catch and harvest for the period 1990-1998 are detailed in Table 29. Stocked species provide a consistently high proportion of the total LTMA catch and harvest (Table 4). Provisional catch averaged 37% of the LTMA total during 1993 - 1997, and harvest for the same period averaged 62% of the LTMA total. Catch and harvest trends will be more clearly defined when the correctly calculated information is available. It is important to note that both catch and harvest appear to be impacted by the size of the fish at stocking. If the hatchery goals for size are met or

Table 29.-Sport catch and harvest of stocked fish in the LTMA waters and totals for all species, 1990-1998 (Provisional).

Year	Landlocked Salmon		Rainbow Trout		Arctic Char		Lake Trout		Grayling		All Stocked Species		LTMA Total	
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest
1990	16,897	6,566	90,860	35,377	2,052	557	1,225	226	5,030	895	116,064	43,621	269,361	75,186
1991	16,363	10,604	82,852	40,039	2,485	909	1,691	461	5,620	1,436	109,010	53,449	229,775	83,453
1992	15,403	6,836	58,011	20,164	5,186	1,597	2,135	380	6,025	692	86,759	29,669	189,811	53,216
1993	10,131	5,976	84,499	27,976	7,173	3,536	2,968	412	9,939	1,433	114,708	39,333	284,361	60,278
1994	9,935	3,645	55,990	17,014	3,108	1,129	1,535	117	20,642	2,665	91,209	24,570	324,024	47,080
1995	10,346	3,445	63,243	21,066	5,658	2,423	1,577	621	9,936	920	90,759	28,475	239,737	59,252
1996	13,682	5,094	116,117	34,382	5,878	1,963	2,687	271	12,526	608	150,890	42,318	316,837	58,414
1997	13,377	5,889	58,736	20,517	5,394	1,769	1,776	318	7,015	176	86,297	28,668	272,462	39,542
1998	19,084	4,872	63,279	20,038	5,677	2,688	2,184	78	15,641	2,231	105,864	29,907	349,162	40,358
Averages														
1990 – 1997	13,267	6,007	76,289	27,067	4,617	1,735	1,949	351	9,592	1,103	105,712	36,263	265,796	59,553
1993 – 1997	11,494	4,810	75,717	24,191	5,442	2,164	2,109	348	12,012	1,160	106,773	32,673	287,484	52,913

exceeded, more anglers are attracted to fish for the larger fish, driving catch up, and a higher proportion are harvested than if the fish are small.

Effort upon stocked waters (provisionally) averaged 36% of the LTMA total effort during the period 1993 - 1997 (Table 30).

1998 SUMMARY

A total of 259,850 fish were stocked into LTMA waters in 1998 (Table 31). The largest proportion were catchables, and the largest proportion of those were rainbow trout.

While total effort within the LTMA declined in 1998, effort upon stocked waters increased. A trend comparison with the five-year average will be made in a future report, when recalculated data is available. Provisional estimated catch and harvest increased.

FISHERY MANAGEMENT OBJECTIVES

Fishery Management objectives are set out in the 1998 Statewide Stocking Plan for Recreational Fisheries, and are addressed in the report in preparation by the Region III stocked waters staff.

FISHERY MANAGEMENT ACTIVITIES/RESULTS

Fishery management activities include publicizing the stocked waters, in order to highlight the additional year-round angling opportunity provided by stocked fish and to provide alternatives to the harvest of wild stocks. Little Harding Lake was successfully converted to a special management lake providing opportunity to catch and release larger than average rainbow trout with a limited harvest opportunity, while more liberal opportunities for harvest were provided within a variety of settings from urban ponds to remote lakes.

BOF ACTIONS

There were no BOF actions involving LTMA stocked waters in 1998.

FISHERY OUTLOOK

As the hatcheries improve their ability to meet the needs of the statewide stocking program and the stocked waters staff are developing the knowledge needed to use the management tools provided by the range of fish species and sizes available, angling opportunity based on stocked waters is improving in the LTMA.

ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES

Research activities and management activities are addressed in the report in preparation by the Region III stocked waters staff.

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Table 30.-Estimated angling effort (number of angler-days) expended on stocked waters in the LTMA and LTMA total effort, 1990-1998 (Provisional).

Year	Stocked Waters	LTMA Total Effort
	Effort	
1990	54,756	133,365
1991	44,018	106,959
1992	32,881	81,378
1993	41,448	103,713
1994	34,332	99,906
1995	45,520	141,231
1996	59,294	159,027
1997	37,751	95,891
1998	39,128	83,430
Averages		
1990 – 1997	43,750	115,184
1993 – 1997	43,669	119,954

Table 31.-Species, number stocked, and size of fish stocked into LTMA waters, 1998.

Size at Stocking	Species and Number Stocked ^a						Total
	Rainbow Trout	Coho Salmon	Chinook Salmon	Arctic Char	Arctic Grayling	Lake Trout	
Fingerling	38,000	37,750			10,000		85,750
Subcatchable	21,600	25,400				10,400	57,400
Catchable	55,750		36,800	7,550	15,550		115,650
Broodstock	1,050						1,050
Total	116,400	63,150	36,800	7,550	25,550	10,400	259,850

^a Depending on hatchery production and management needs, other mixes of sizes and numbers of each species are stocked in other years.

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APPENDIX A

Appendix A.-Area regulations for the LTMA.

GENERAL FISHING SEASONS

The Tanana River drainage is open to sport fishing the entire year—**except for those seasons listed below or under Special Regulations.**

The open season for fishing in Little Harding Lake is **May 15 through September 30.**

Northern Pike Fishing Season:

The open season for northern pike fishing in **flowing waters** of the *Lower* Tanana River drainage is **January 1 through December 31—except:**

In the Tolovana River drainage, including Minto Flats and Goldstream Creek, including the Chatanika River, the open season for northern pike is **June 1 through Oct. 14.**

The open season for northern pike in **lakes** of the *Lower* Tanana River drainage is **June 1 through April 20—except:**

In Harding Lake, the open season for northern pike is **June 1 through March 31.**

Use of Spears or Bow and Arrow

- ☐ Suckers and burbot may be taken with spear or bow and arrow the entire year.
- ☐ Northern pike may be taken by spear or bow and arrow from **September 1 through April 30** and may be speared only by persons completely submerged from **Jan. 1 through Dec. 31, except in lakes and in the Tolovana River drainage (see above).**
- ☐ Whitefish (excluding sheefish) may be taken by spear or bow and arrow from **Sept. 1 through April 30** and may be speared the entire year **only** by persons completely submerged.

BAG, POSSESSION, AND SIZE LIMITS

GENERAL REGULATIONS

The general regulations for all waters of the Tanana River drainage are listed below. **Special regulations** for individual water bodies are listed on pages 12-15.

-continued-

Daily Bag, Possession, and Size Limits

Species	In Flowing Waters	In Lakes
King salmon	1 no size limit	10 in combination
Chum salmon	{3 in combination}	no size limit
Coho salmon	{no size limit }	
Arctic char/Dolly Varden	10 no size limit	10 no size limit
Lake trout	2 no size limit	2 no size limit
Rainbow trout	10 no size limit	10 no size limit
Arctic grayling	5 no size limit	5 no size limit
Whitefish	15 no size limit	15 no size limit
Sheefish	2 no size limit	2 no size limit
Northern pike	5 (only 1 over 30 inches) (open season—June 1 through March 31)	5 (only 1 over 30 inches)
Burbot	15 no size limit	5 no size limit
Other fish	no bag, possession or size limits	

-continued-

Burbot set line regulations

Statewide

- ☐ The total aggregate number of hooks which may be used each day for set lines may not exceed the daily bag limit for burbot in the water being fished (e.g., if the daily bag limit is five burbot, then a total of five hooks may be fished each day). More than one hook may be attached to a set line.
- ☐ All hooks must be single hooks with a gap between point and shank larger than $\frac{3}{4}$ inch.
- ☐ Each hook must be set to rest on the bottom of the lake or stream.
- ☐ Each set must be labeled with the angler's name and address.
- ☐ Each set must be physically inspected at least once during each 24-hour period.

Tanana River drainage—lakes

- ☐ Burbot set lines **may not** be used in Harding Lake.
- ☐ In all other lakes in the *Lower* Tanana River drainage, burbot set lines may be used **only** from October 15 through May 15.
- ☐ Daily bag and possession limit in lakes where set lines are allowed is 5 burbot, any size.

Tanana River drainage—rivers and streams

- ☐ Set lines may be used year-round to catch burbot in all flowing waters of the Tanana River drainage.
- ☐ Daily bag and possession limit in rivers is 15 burbot, any size.

Ice houses

All ice houses not removed from the ice at the end of a day's fishing must be registered and a permit obtained from the ADF&G. Each registered ice house must have the permit number displayed on its side and roof in distinguishable numbers not less than 12 inches in height. Ice houses must be removed from all water bodies by April 30.

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SPECIAL REGULATIONS

Unless listed below, seasons, bag and possession limits for the *Lower* Tanana River drainage appear in the general regulations.

CHATANIKA RIVER AND ITS TRIBUTARIES:

1. Arctic grayling:

April 1 through May 31, ***catch-and-release only***. All grayling **must be released** immediately.

June 1 through March 31, daily bag and possession limit is 5 fish. All **must be 12 inches or larger**.

2. April 1 through May 31, only unbaited, single-hook, artificial lures may be used upstream from the ADF&G marker located 1 mile upstream of the Elliott Hwy. bridge.

3. ***Closed to all salmon fishing*** upstream from the ADF&G marker located 1 mile upstream of the Elliott Highway bridge.

4. ***Closed to all whitefish fishing:***

- from September 1 through April 30, upstream from the ADF&G marker located 1 mile upstream of the Elliott Highway bridge.
- from October 1 through April 30, downstream from the ADF&G marker located 1 mile upstream of the Elliott Highway bridge.

5. Northern pike:

- season open June 1 through October 14 only.
- daily bag and possession limit is 5 fish; **only 1 may be over 30 inches long**.

6. Only a **single hook** may be used when fishing in that portion of the Chatanika River from the mouth of Goldstream Creek upstream to the boundary of the Fairbanks Nonsubsistence Use area (identified by an ADF&G marker located approximately 1 mile downstream of the Murphy Dome Road).

CHENA RIVER AND ITS TRIBUTARIES:

1. Arctic grayling:

- ***catch-and-release only*** for the entire year. All grayling **must be released** immediately.

2. Upstream of Chena River dam, only unbaited, single-hook, artificial lures may be used.

3. Downstream of Chena River dam, bait may be used on hooks with a gap larger than $\frac{3}{4}$ inch.

-continued-

Special Regulations-continued)

4. ***Closed to salmon fishing*** upstream from the ADF&G marker located 300 feet downstream of the Chena River dam.

FIVE-MILE CLEARWATER CREEK:

1. Arctic grayling:
 - daily bag and possession limit is 2 fish, **only one** of which **may be over 12 inches**.
2. Only unbaited, **single-hook**, artificial lures may be used from January 1 through August 31.
3. Only unbaited, artificial lures may be used from September 1 through December 31.

HARDING LAKE:

1. Northern pike:
 - open season June 1 through March 31.
 - daily bag and possession limit is 5 pike; **all must be 26 inches or larger**.
2. Burbot:
 - daily bag and possession limit is 2 fish, no size limit.
3. Set lines may not be used.
4. Harding Lake is closed to the taking of northern pike with spear or bow and arrow.
5. Lake trout:
 - daily bag and possession limit is 2 fish; **all must be 18 inches or larger**.

KANTISHNA RIVER DRAINAGE (downstream from the mouth of the Toklat River):

1. Chum salmon:
 - August 15 through December 31, ***catch-and-release only***. All chum salmon **must be released** immediately.

LITTLE HARDING LAKE:

1. Open to fishing from May 15 through September 30 only.
2. Only unbaited, single-hook, artificial lures may be used.
3. Rainbow trout:
 - daily bag and possession limit is 1 fish which **must be 18 inches or larger**.

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PILED RIVER SLOUGH (upstream from its confluence with Moose Creek):

1. Arctic grayling:
 - *catch-and-release only* for the entire year. All grayling **must be released immediately**.
2. Only unbaited, **single hook**, artificial lures may be used.

SALCHA RIVER AND ITS TRIBUTARIES:

1. Arctic grayling:
 - April 1 through May 31, *catch-and-release only*. All grayling **must be released** immediately.
 - June 1 through March 31, daily bag and possession limit is 5 fish. All **must be 12 inches or larger**.
2. Only unbaited, artificial lures may be used upstream of the Richardson Hwy. bridge, except that bait may be used only on hooks with a gap size larger than $\frac{3}{4}$ inch throughout the Salcha River drainage.
3. Fishing from the Richardson Highway bridge over the Salcha River is *prohibited*.
4. *Closed to salmon fishing* upstream from the ADF&G marker located about 2½ miles upstream of the Richardson Hwy. bridge.

TOKLAT RIVER DRAINAGE: *Closed to sport fishing August 15 through May 15.*

TOLOVANA RIVER DRAINAGE—including Minto Flats, Tatalina River, and Goldstream Creek:

1. Northern pike:
 - season open June 1 through October 14 only.
 - daily bag and possession limit is 5 fish; **only 1 may be over 30 inches long**.